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FUTURE

LIFE

August 1979 #12

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ON THE COVER: An impromptu aerial ballet staged during the climax of United Artists' *Moonraker*. Trapped aboard Drax's orbiting space station, agent James Bond halts its orbit, causing a zero-g situation and sending Drax's henchmen into their own space.

ON THE CONTENTS PAGE: D. Owen Stevens' portrayal of the Milky Way as seen from the Peruvian Andes was painted while on an eclipse expedition to South America. Reprinted from *Space Art* (Starlog Press) now in its second printing.

output

The Incredible Shrinking Computer

Suppose that in 1952 you had stuffed \$100 under your mattress, for a rainy day. If you pulled it out today (these are rather rainy times) you'd find it had diminished to *less than half* its original purchasing power. In 1979 your \$100 would be worth about \$41.

Inflation is the culprit—it causes prices to soar while products deteriorate in quality. "Give 'em less" or "charge 'em more" are the choices a businessman has, and sometimes he does a little of both—to ease the blow.

But the computer field is a dramatic exception. Your \$100 stash, pulled out today, would buy the equivalent of \$18,000 in data processing capacity.

IBM's recently-announced 4300 series processors—utilizing incredible new 64,000-bit memory chips (actually smaller than a fingernail)—are an example of "give 'em more" and "charge 'em less!"

In 1952, IBM's 701 computer cost \$221,867 for one million bytes of storage, but the new 4341 will cost a scant \$430 for equivalent storage. As if that weren't enough improvement, processor *speed* has increased from 2,193 multiplications per second in 1952 to a whopping 239,120 in 1979.

Most amazing, the physical *size* of computers has shrunk almost magically. In 1953 the IBM 650 required 400 cubic feet of space for hardware to store one million characters (that's a room 10 feet high, 20 feet long, and 10 feet wide—filled to the brim). Today, that exact same capacity fits into .03 cubic feet—about the size of a baseball!

The incredible thought, for those of us interested in the future, is that there is no indication that this efficiency/size/cost trend has reached a climax or is even slowing down. Don't forget that just ten years ago most of us thought transistors were the ultimate miniaturization. Today, in the computer field, transistors are as antique as vacuum tubes.

The computer industry will continue to build smaller, quicker, cheaper hardware, and the future efficiency (and fun) this will add to our lives is the topic I will explore in detail next issue.

Think what it would be like if *all* fields were heading in this direction. What's the secret? What do the guys in the computer industry know that the rest of the world needs to learn?

During the past two decades huge sums of money have gone into data processing research and development—mainly because the government space program required major innovations—small, lightweight components beyond anything needed on Earth. Because this research was funded by government contracts, on an accelerated basis, and not from regular company profits, the computer industry has been somewhat artificially removed from the economic constraints of inflation.

Inflation is the enemy of progress mainly because it tends to cut out the big profits that make research and development possible. No sane businessman is going to commit vast sums of money and company personnel to high-risk, long-range research projects unless he has what some call "excess" profits—more money than will be needed to run and expand the regular business.

I am *not* suggesting that government-funded programs (like space) are the proper routes to expensive technological research. In fact, that would add gigantic costs to government budgets, making higher taxes necessary, leading to the need for higher salaries, and forcing business to raise prices. No, the road to research is paved with business profits—which happens when there is *less* government bureaucracy. Therefore, *less* taxes are needed, therefore consumers have *more* money in their hands, therefore they can buy more products.

IBM's incredible shrinking computer is proof of what happens when a company makes huge profits, and invests a great deal of the money in research and development because it is greedy for *more* profits. In spite of what politicians and social do-gooders say, the self-interest motive in business is the key to all the wonders of the future—for everybody.

Kerry O'Quinn/Publisher

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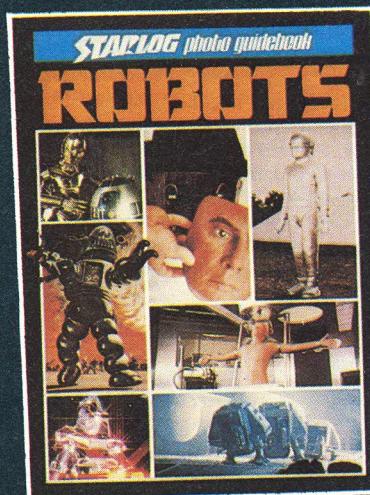
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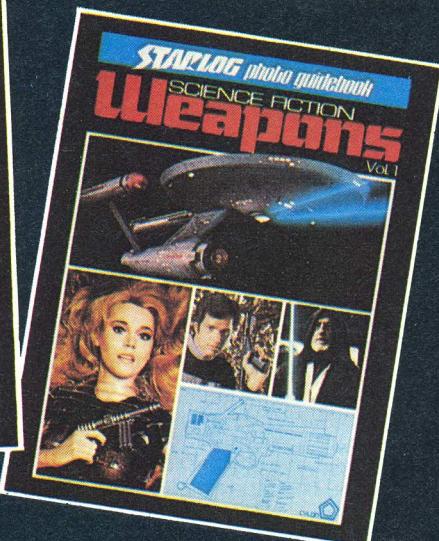
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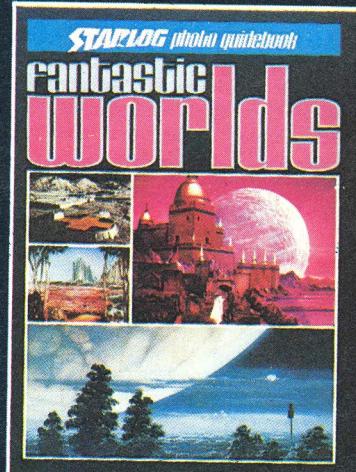


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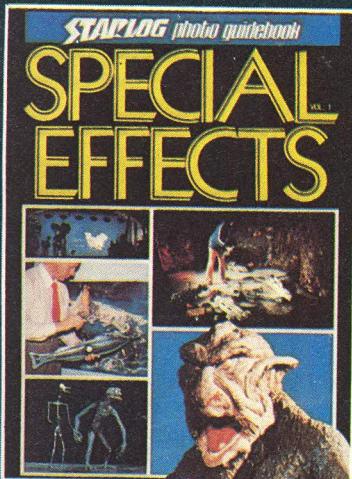
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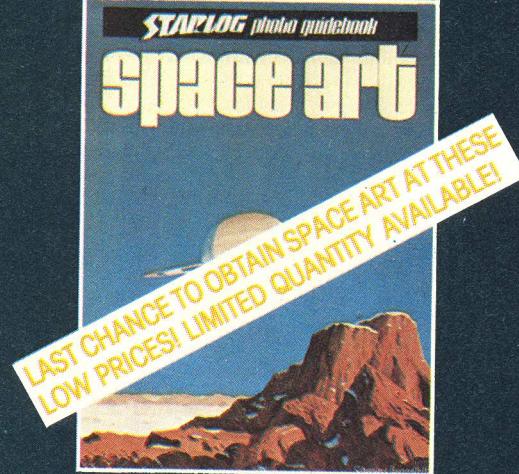
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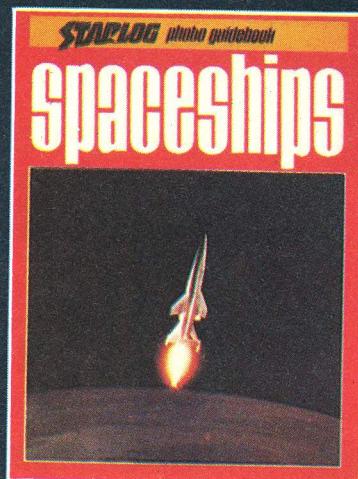
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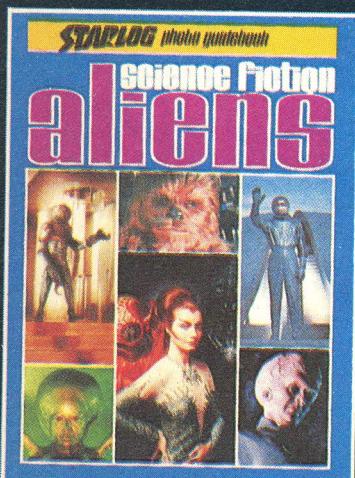
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THREE MILE LESSON

...Well, how lucky can Columbia Pictures be! No sooner does it release *The China Syndrome* (FUTURE LIFE #10) than we have a real nuclear accident. And by amazing coincidence five other atomic facilities are closed, and *National Geographic* and *Popular Science* have articles on atomic energy. I live 200 miles from the Three Mile Island station, but for 23 years I have lived only 15 miles downwind of the now closed Shippingport plant. For this reason I have chosen to write you.

By the latest reports that I've heard, maybe the accident near Harrisburg could have been averted. It could also have been far worse. What does one do when a thing this serious happens? You protest. Cry for all of the nuclear plants to be closed forever. Thousands of jobs will be lost and millions will receive a 20 percent increase in their electric bills.

Okay. Nuclear power is dangerous and mysterious. But don't get rid of it, learn from it. The *Amoco Cadiz* ran aground and ruined beaches and shellfish beds for decades. But supertankers still ply the oceans. Railway tankers spill deadly chemicals, but still roll over the rails. Airline crashes kill hundreds, but still we fly. I could go on, but the point is clear.

We are at a time in our history when our energy demands are about to exceed our ability to produce it. About 50 percent of our oil is imported, coal is not a fully developed source, natural gas is tougher to get at. We can't afford to lose the 15 percent that nuclear energy contributes to our supplies.

Since it was the first major nuclear accident, Three Mile Island must be the example we will learn from and try to avoid. If the public wants nuclear power eliminated, then they must be prepared to pay for the less abundant safer fuels. There is, however, a better course of action.

Write to your congressperson, your representative, and your president. Tell them to allocate more funds for space programs. Solar power satellites, orbiting labs and lunar bases would ease the shortages and develop new resources. They would create jobs, not cut them. Spinoff technology would create even more jobs. Would they really be more expensive, per capita, than a 20 percent rate hike? People, let us keep the nuclear plants until the day when solar, or some other energy source, gives us cheap, clean, safe and unlimited supplies for future generations.

W.S. Soltis
Baden, PA

ONE SMALL STEP

...After reading the letter in FUTURE LIFE #10 from Elissa Wynn referring to Space Awareness Day, I called the office of the governor. Although I did not speak to Governor Quie himself, his proclamations assistant listened to me, and asked me to send all pertinent informa-

tion to his office.

Today I received an envelope in the mail and found, to my utmost surprise, the proclamation was accepted! I'm going to attend the signing and meet Governor Quie sometime in June or July. Also, I intend to write to President Carter for a national proclamation, but it will be much more difficult.

I hope that all your readers participate, and to those trying for a state proclamation, I encourage a phone call, since state offices receive hundreds of letters each day.

Joe Rudich
St. Paul Park, MN

MEDIA BLITZ

...With the upcoming 1980 elections close at hand, gasoline prices skyrocketing and the Harrisburg fiasco fresh in our minds, the time seems ripe to make the big push for space colonization. The people are desperate and they are tired of doomsday scenarios. Space colonization offers a way out of our current mess.

The mainline media should be made completely aware of the promise of this alternative. Write letters to newspapers. Phone into radio shows that are anti-nuclear and/or pro-solar. Communicate with congressmen and consumer advocates such as Ralph Nader. Go to anti-nuke and pro-solar demonstrations and demonstrate to them how space colonies and power satellites are an ecological alternative as well as being feasible.

Support ground-based solar alternatives. We will need power to get us through the energy crunch. Solar power satellites won't be operational for quite a while. Coal plants take eight years to build. Windmills and solar collectors can be built more quickly and they will be at their optimum during peak demand hours (hot summer days). They will also be a desirable method of energy production after the SPSs are in orbit. That is why they are worth it even if they cost more.

In addition, supporting a ground solar program is good politics. So is support of conservation and advocacy of garbage burning plants and wood stoves. After all, we're all working for the same thing: Clean energy and less pollution of all kinds.

Andrew Heugel
Coram, NY

CYLVONS, BROWN & YOU

...I have just been informed that ABC's *Battlestar Galactica* is being cancelled. Now we cannot let this happen. I do agree that the show has some problems. But they can be cured. So let's do for *Battlestar Galactica* what the fans of *Star Trek* did in the '60s. Science fiction fans of the world—write!

Jerry Brown has just announced his campaign for the presidential office. I believe this man is our hope—he supports the space program, solar energy and saving the environment. We science fiction fans can have a small impact on the race, but let's give it our best shot. It may be our only one.

Willie West
Aurora, IL

SEEING RED

...I recently saw James Doohan (Scotty of *Star Trek*) at the University of Colorado at Boulder. I was impressed with his speech about how the president is only allowing a mere couple of billion

dollars for the space program. Where is this country going to end up if the Russians advance far ahead of us in space?

I just want to make one thing perfectly clear: If, in 1980, this country hasn't elected a President who is capable of running a space program with sufficient funds, we might as well start learning how to speak Russian, because World War III is not far off.

John Morgan
Boulder, CO

NEUTRAL CORNER

...I don't think FUTURE LIFE should take sides in the upcoming presidential elections. But maybe you could interview the candidates and help us keep track of what they're going to do about space exploration and industrialization. The daily news media seldom ask questions about the space program.

Jeffrey Gritz
Waverly, MN

TIME WARP

...Congratulations! You seem to have put the Space shuttle program ahead one whole year! Let me explain...

In FUTURE LIFE #10, I came across a Databank article entitled "NASA Names Shuttles" which stated that *Enterprise* was used in "the 1976 approach and landing tests." Upon checking with a file of newspaper clippings I keep on scientific events, my suspicion was confirmed—the A and L tests took place in 1977!

I'm sure this error was accidental; you must know that playing with time can have disastrous side effects!

Bill Brunning
Maspeth, NY

PIONEER SPIRIT

...I have been a FUTURE LIFE reader since the start, and I am very pleased with most of what I read. One subject that has been dealt with is that of space colonies. They have been a dream of mine every since I can remember. Hopefully, with the help of Gerard K. O'Neill and Sen. Harrison Schmitt it might one day become a reality.

I expect there are tens of thousands of people like me who are asking and saying, "Where do I sign up?" "Please don't leave me behind." I am not an engineer, but I would scrub windows and floors if it would make my dream come true. (However, if they have got a job for a telemetry tech, let me know.)

It is time for us as a world to move on and I hope enough people will agree to let us do so.

Paul J. Heidt
Humboldt, IA

TREK SEX

...I was rather satisfied with the speculation and imagery in "A Vision for Star Trek." (FUTURE LIFE #10) I was also surprised to see Jesco von Puttkamer slip in a little sexual fantasy (SF?). Let me just take one example:

About those belts....

For everyday wear, these status items, like Rolls Royces, would probably be left to performers of the Las Vegas/Wrigley's Planet circuit, and the professional hookers (Human Pleasure Agents, licensed, of course) who tend

to change and/or remove their attire a lot. Most of us regular working stiffs, brought up for years by our folks not to press our Clothing-Discard buttons for just anybody, would probably prefer regular fabric clothing for thrashing around in at the office, or for shuttling over to Aspen from New York or Tahiti for that weekend ski trip when you don't really know the ski partner you met at the terminal from Adam or Eve (sometimes you can't be sure because he/she might be in his/her second puberty, or he/she might be working for one of those haughty multi-planetary corporations recognized as governments, with customs radically different from ours). And heaven forbid if you forget to change those batteries at the recommended service interval and they die on you in the middle of a degravitated dance floor!

I. Abro Cinii
Brooklyn, NY

THINGS THAT CAME

...We act on behalf of Gerry Anderson, Gerry Anderson Productions Limited and Gerry Anderson Marketing Limited.

Our clients have drawn our attention to the bottom drawing on page 27 and to the drawing on page 28 in the May edition of FUTURE LIFE (#10). The drawings and their captions are part of an article in the magazine on *The Shape of Things to Come*.

Our clients are entitled to copyright in the artwork featured in the two drawings, but these have

been published by you without their consent. Accordingly, you have infringed our clients' copyright.

We are therefore instructed to seek confirmation that you will print a prominent retraction in the next edition of FUTURE LIFE stating that the two drawings were published without the consent of the copyright owners and that there is no connection whatsoever between our clients and the film *The Shape of Things to Come*.

Herbert Oppenheimer, Nathan & Vandyk
Solicitors
London, England

Harry Alan Towers, executive producer of the film, cleared up the mystery of the "who's who" artwork in a recent letter to FUTURE LIFE which stated "...through an error on the part of one of our Production Departments we made available to you, together with other materials, illustrations which are the property of Gerry Anderson, producer of Space: 1999 and other highly successful television series. At one time Gerry had been working with us on the project but is no longer associated with the production and none of his artwork or other materials are incorporated in the film or proposed television series based on H. G. Wells' The Shape of Things To Come." In a prepared statement, SOTTC Film Productions Limited went on to state that "...we have also been informed that the pictures on pages 27 and 28 were printed without the consent of the copyright holders. We and the producer of the film apologize to all concerned."

MARTIAN MYSTERY



PHOTO NASA/JPL

...I'm writing this letter because you may be able to tell me more about the Mars and Jupiter probes. Firstly, is all the information sent back from both probes made available to the media?

Secondly, shortly after the Mars probe supposedly landed on Mars, a picture of a rock was released with what appeared to be letters and numbers on its surface. From what I gather, this picture was released worldwide (it made front page on most of the papers here), but the next day and ever since there has not been a word said of this find. Is there any way of finding out if this was a real find, and if it was, why was it hushed up?

Frank Drayton
Burwood, NSW, Australia

Not all the information sent back by NASA probes is made available to the media because NASA, in its wisdom, knows that the press would overdose on the facts. They do a good job of keeping the media up to date on highlights, but it

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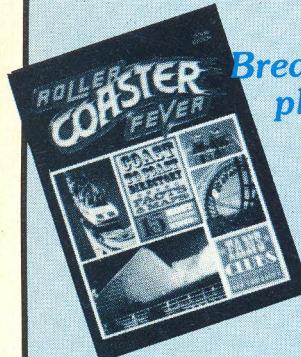
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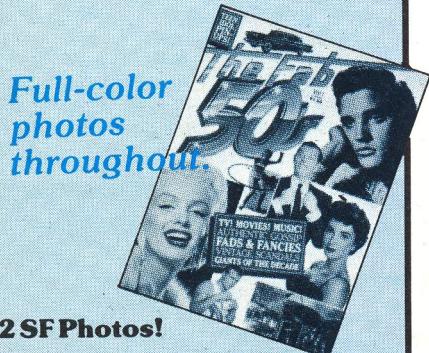
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input

takes NASA's scientists years to analyze all the information sent back by probes such as *Viking* and *Voyager*.

According to the public information office of the Jet Propulsion Laboratory, the rock you saw in the newspapers was photographed by the *Viking 1* probe in late July, 1976. Because of its natural formations, if the sunlight was right you could see what appeared to be the letter "B" inscribed on its surface. However, if the sunlight hit it a different way, it simply appeared to be your normal, everyday Martian rock.

OLD HABITS

... Mr. Leary really hasn't changed much during the last decade. He still promotes his anti-establishment attitude; however, in quite a mutated form. The United States (establishment) took us to the Moon, not Timothy Leary. It seems some haven't seen the tune-in—drop-out psyche for what it was and is. We've come through a decade of turmoil because of this type of anti-technology view. This country lost most of its college and space programs due to the priority shift to welfare funding and other social (non-productive) programs. The guru Timothy Leary did a 180 degree turn, it might appear, to get in—let's go.

Dan Chesley
Klamath Falls, OR

SMILES

... To Timothy Leary: I love you. Please smile on. The only LSD I ever took I manufactured in my own head, unexpectedly.

M. F. D. Armstrong
Scarsborough, Ont., Canada

PLANETARIUM PIONEERS

... Phil Harrison's "Theaters of Tomorrow (FUTURE LIFE #9)" was an excellent overview of the modern planetarium. Although he mentioned many of the innovators involved in planetarium development, Harrison omitted the central figures in the transition from the old-style constellations lectures to the computer programmed multi-media productions now seen in most planetariums. The imagination of Ian C. McLennan and the technical wizardry of John J. Paris combined in the late '60s to produce the greatest philosophical and technical advances since the invention of the star projection theater in 1925. Considered heretical at the time, their productions at Rochester's Strasenburgh Planetarium are now—a decade later—widely emulated throughout the world.

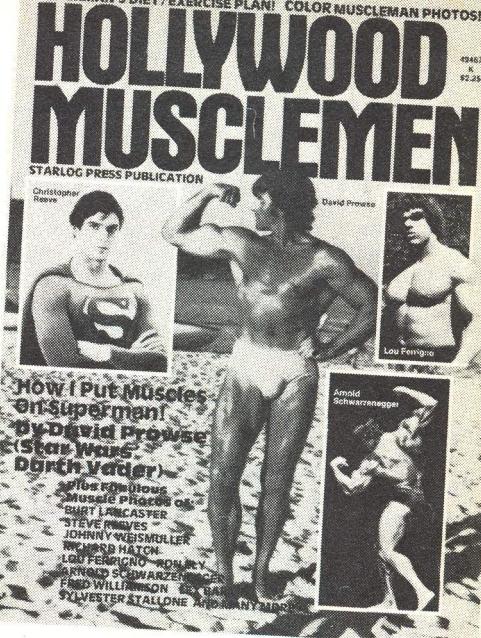
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HOLLYWOOD UP NORTH

... FUTURE LIFE #10 is your best yet. The slick, professional design pushes your magazine to the rank of excellence seen in the more established magazines, after only 10 issues. I especially enjoy the abundance of science fact (space colonies) and space art. Gallery is a feature I eagerly await, as these visions are truly stunning works.

I enjoyed in particular the article in Databank on the making of Altman's film *Quintet*, as I live on the south shore of the St. Lawrence, about a kilometer or two from the "Man and His World" site where *Quintet* was filmed. The pavilions which remain were also used in two recent episodes of *Battlestar Galactica*: "Greetings from Earth" and "Experiment in Terra" (as the aban-

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doned city on Peradine and the government HQ on Terra, respectively).

Montreal is fast becoming a second Hollywood, as half a dozen films have been shot here over the past year. I would like to point out that, although the winter of 1977-78 was the worst in my memory, it is not always that cold here. Our summers are very warm and humid, and "frigid Canadian air" is only a reality for four months.

Michael Gilson
St. Lambert, Que., Canada

ALL THAT JAZZ

...I am beginning to detect a slant in FUTURE LIFE toward the promotion of numerous rock music groups and individuals (Devo/Rupert Chappelle/Kraftwerk) because they appear to deal with some quaint "new life" philosophy or dabble in some electronic wizardry.

I don't wish to see a magazine of such fine (potential) quality continue to support, or perhaps I should say report, the instant, disposable music that these rockers are manufacturing, and then go on to hype it as significant music. Lou Stathis, for example refers to Chappelle's disc (FUTURE LIFE #9) and calls him a "maverick... who create(s) the trends of tomorrow today." Nonsense. If Mr. Stathis or anyone else wants to obtain a possible insight into the sound of music that is paving the road to music's future, he should direct himself to the avant-garde, experimental composers from the classical or jazz side of music, and the numerous groups devoted to free improvisation (electronically or acoustically derived), or the theoretical/thought music of organizations like "Fluxus." Such music is far more advanced than those pop-rock purveyors who continuously borrow and churn up the parameters of traditional music.

Michael S. Horwood
Bramalea, Ont., Canada

WHAT IS ART?

...FUTURE LIFE is very well done, but there is something missing.

In every issue of your magazine, there should be a critic on the science fiction, horror and fantasy movies that have just been released, done in the same way as with the books in In Print.

Marc Tessler
Drummondville, Que., Canada

Movie reviews are confined to the Input column (see below).

THE BUCK STOPS HERE

...I am writing as an enthusiast who has witnessed an art form being hideously ripped apart and thrown back 500 years.

I refer, of course, to *Buck Rogers in the 25th Century*, a film hell-bent for glory as probably the most inane attempt at SF ever achieved by man. Words can barely convey the abject horror I experienced while watching a totally unbelievable plot spiced with marginal special effects lurch to an incredibly cheap finale. Damn near puked when Twiki started spitting off-color one-liners whose pointless dominance in the film was surpassed only by their bad taste.

Surely there is at least one other writer on Earth who is still capable of producing a quality screenplay to accompany those spectacular special effects Hollywood clones for fun and profit.

The shattering blow dealt SF by this hot-dog

kamikaze will no doubt sabotage the positive momentum generated by *Star Trek*, *Star Wars* and *CE3K*. Unless Hollywood comes back with a quality product, there is a very real risk of disillusioning enough down-home enthusiasts such as yours truly to totally wreck the SF market.

After 90 minutes with Buck, it won't take much.

Anthony P. Molla, Jr.
Chester, PA

MISSING IN ACTION

...In FUTURE LIFE #9 you have an interesting article on the new James Bond film *Moonraker*. It looks to be a very interesting film, but at the end of the last Bond movie, *The Spy Who Loved Me*, I saw the title *For Your Eyes Only* advertised as the title of the next James Bond movie. Could you tell me what happened to it?

Bob Binomaki
Calumet, MI

The title was put on hold by Bond producer Cubby Broccoli.

INFO

...In FUTURE LIFE #9 I particularly enjoyed the article entitled "Imagining the Future." I would also like to tell you about the "Life of the Universe" exhibit at the National Air and Space Museum in Washington, D.C., showing paintings portraying life on other worlds.

Steve Bowen
Titusville, FL

FUTURE FAN

...I have been a reader of yours from FUTURE #1, and my favorite issue was #9.

I would very much like to see three things in your magazine in the future:

1. I would like to see some help on becoming a success in science fiction.

2. Why not give a tour of your magazine? Show us what you put into every issue. Show us your working conditions in the office.

3. More stories of life in the future such as Civilizations in Space. Tomorrow is good, but I would like more of a fictional view.

You have a great magazine, and I hope your second year is as good as the first (or better!).

Timothy Erickson
St. Paul, MN

SATISFACTION

...I just had to tell you how satisfied I am with your magazine. I am completely ready to renew my subscription once my last order has run out.

Even in the products you advertise in your magazine, I have not only found great quality but also good prices.

I have found out that your magazine and your sister publications put out one great issue after another. You never cease to amaze me. Your magazine scoops up the latest SF information way ahead of your rival magazine.

John O'Donnell
Palas Heights, IL

What rival magazine?

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Thomas M. Disch

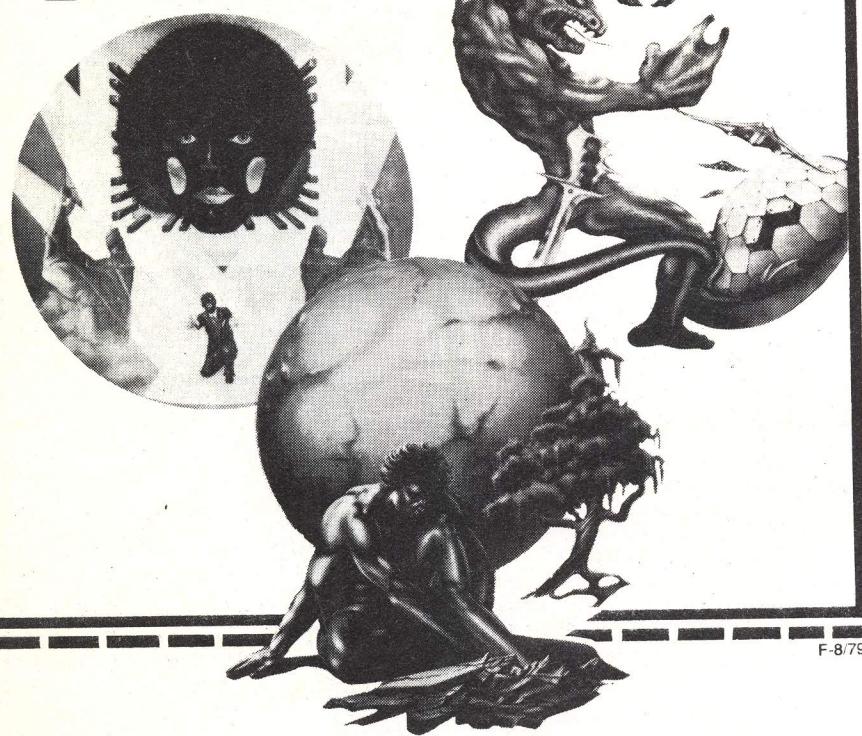
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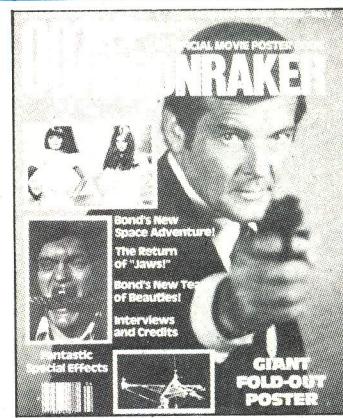
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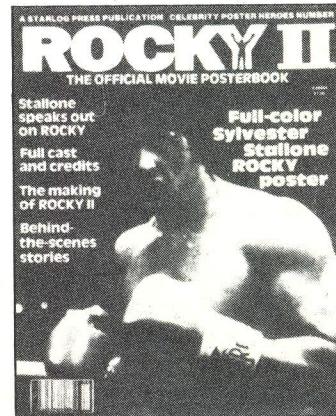
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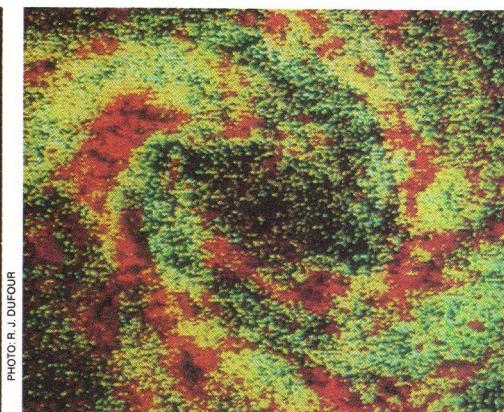
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SPACE SCIENCE

VIEWING DISTANT GALAXIES IN COLOR



Spiral galaxy M83 (left) becomes a galactic rainbow (right) with computer enhancement.

Color photography has been a standard tool of astronomers for a number of years, but it has been limited to stars in our own galaxy. Many hours of exposure are required to photograph other galaxies, even the nearest and brightest; no color film can maintain a stable color balance that long. But recently Drs. Raymond Talbot, Jr., Reginald Dufour and Eric Jensen, all of Rice University, have devised new methods for photographing galaxies in color. In addition to the spectacular visual effects seen in these photographs,

they immediately show where the older, redder stars (or young blue ones) are located.

The Rice astronomers begin by taking black and white photos using ultraviolet, blue, yellow and red light. They then use a computer to produce, from these, a picture of the galaxy in its true colors.

The computer can be used to give other types of pictures as well: showing the location of galactic dust, for example, or of star clusters. Perhaps most significant is the photo showing star cluster ages in the spiral galaxy

M83. The computer recognizes clusters by their grainy light distribution, and their ages by the color of the stars—in this picture the youngest clusters are shown in blue, successively older ones in red and yellow. A simple glance at the photo shows there is no systematic progression of cluster ages with angular position, as predicted by some theories of star formation. This new, detailed data is already sending many theoreticians scurrying back to their proverbial drawing boards.

—W.A. Thomasson

EXPLORATIONS

VENUSIAN VALLEY DWARFS GRAND CANYON

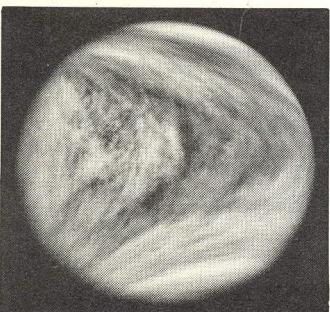


PHOTO: NASA

At left is the first close-up full-disc picture of Venus, taken from a distance of 40,000 miles on February 19, 1979, by the Pioneer Venus Orbiter. The Orbiter will continue to send back data until April 1980. At right, an artist's conception of the recently discovered Venus rift valley, believed to be the largest canyon in the solar system—three miles deep, 175 miles wide and 900 miles long.



BREAKING GROUND

VOYAGER PLAYS PINBALL

The Voyager space probe, which at the time was just nearing Jupiter, was guest of honor at a groundbreaking ceremony for the future space museum Cosmophere in Hutchinson, Kansas.

Max Ary, director of the Hutchinson Planetarium, thought it might be fun (not to mention good publicity) to have the initial ceremonial blast touched off by an actual spacecraft. With the full cooperation of NASA, the stage was set for a rather dramatic and complex chain of events.

The entire sequence, which took exactly one hour, went something like this: on Saturday, February 17th, at 3:25 p.m., NASA officials at the Jet Propulsion Laboratory in Pasadena, California, sent a message to the Voyager, causing it to transmit a signal back to Earth. This signal was picked up 35 minutes later by monitoring equipment in Australia, bounced off an orbiting satellite, received by the Pasadena station and sent via telephone lines to Hutchinson, where it tripped a laser at 4:24 p.m., setting off a very satisfactory explosion.

Rube Goldberg, eat your heart out.
—Barbara Krasnoff



No. 1—Premiere Issue

Interview: Fred Pohl.
The Man From Planet X.
Tomorrow: Isaac Asimov.



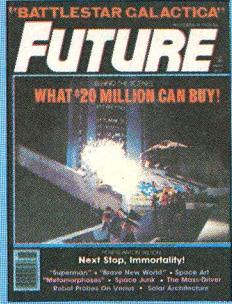
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The Truth Behind Cosmos 954.
Interview: Arthur C. Clarke.
Tomorrow: Norman Spinrad.



No. 3—

Quasars, Pulsars & Black Holes. The SF Films of Jules Verne. Tomorrow: Fred Pohl.



No. 4—

Interview: Alvin Toffler.
History of the SF Pulps.
Tomorrow: Ben Bova.

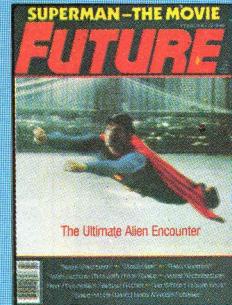
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Collier's 1951 Space Program.



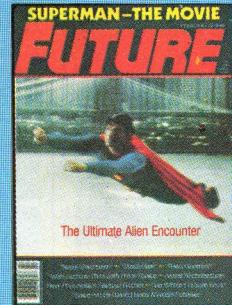
No. 6—

Architecture: Solar Houses.
O'Neill's Mass-Driver.
Tomorrow: Robert Anton Wilson.



No. 7—

Future Planetary Probes.
San Diego Space Theater.
Careers in the Space Program.



No. 8—

Arcosanti: Future City.
Space Art: David Hardy.
EarthSat: Computer Photos.



No. 9—

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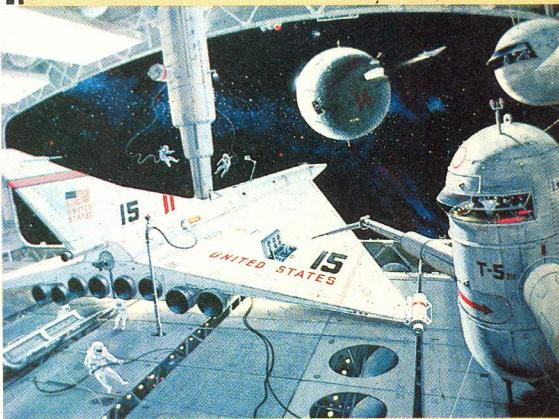
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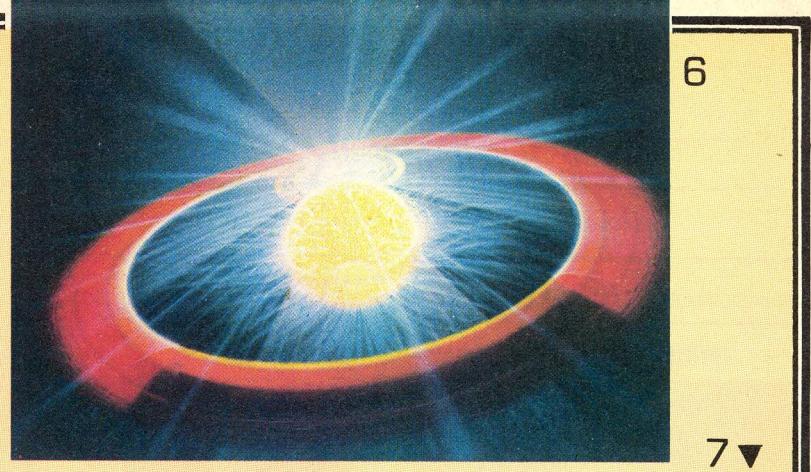
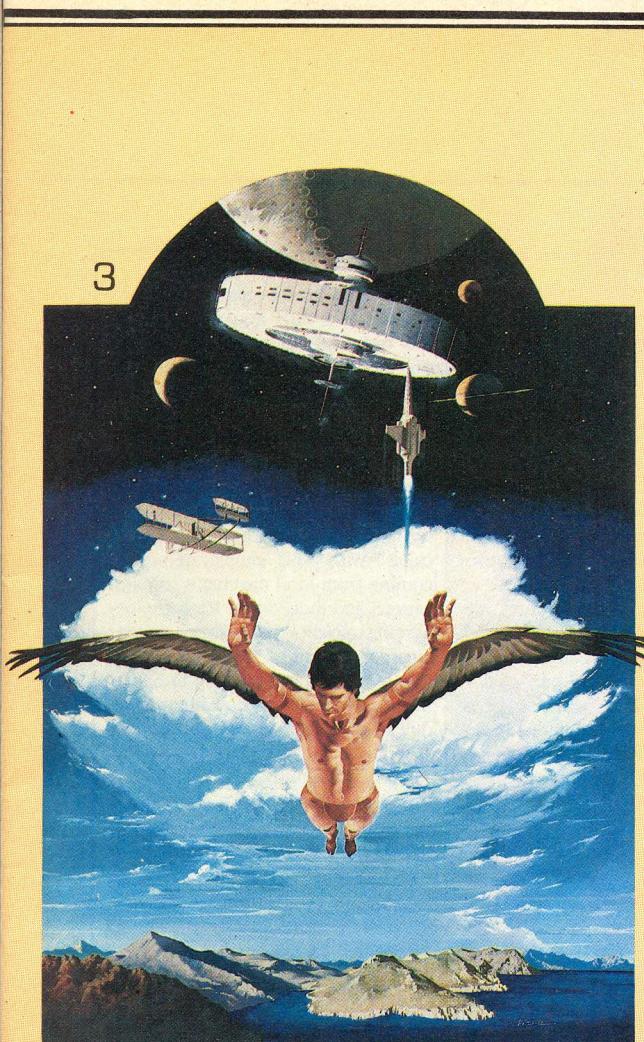
The Space Art Club

The introduction of the Space Art Club to the readers of STARLOG/FUTURE LIFE marked a historic event. Never before was such an offering available; a series of limited-edition space art prints at a price most everyone could afford. Charter members have written expounding their satisfaction, but the original deadline prevented would-be members from joining at a savings price. Now, we're pleased to announce that you, too, can have an opportunity to own and enjoy fantastic space art at bargain rates.



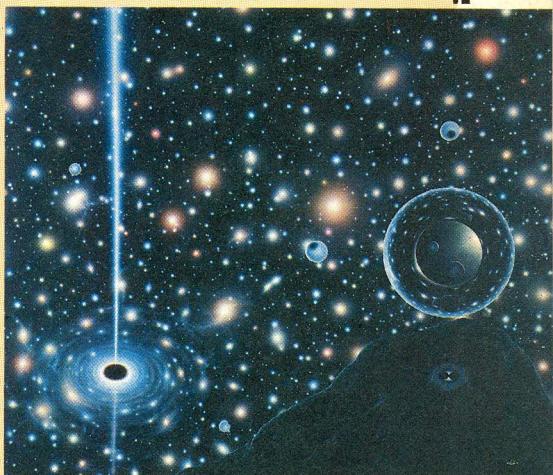
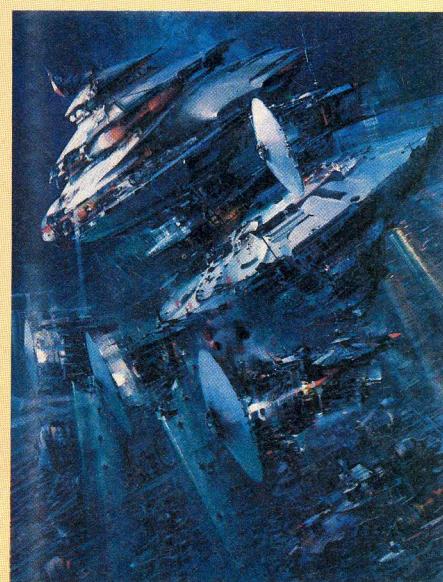
The Club features exclusive, limited-edition space art painted by the masters of the field: Bob McCall, Vincent DiFate, Ron Miller, Adolf Schaller, John Berkey, Ludek Pesek, Don Davis, plus one mystery artist prominent in the space art field. Virtually the Hall of Fame in space art, this incredible group represents a staggering collection of artistic techniques and scientific imagination. Each print was specially commissioned by STARLOG/FUTURE LIFE and produced on high-quality, textured paper, measuring approximately 18" x 24" in size, ready for framing!

For your convenience, there are different ways in which you can order this exclusive space art. Choose from one of these opportunities: *The Complete Collection*—the entire portfolio consists of all eight space art reproductions for only \$45.00; *Mini-Series A*—comprises print #'s 1-4 representing the artwork of McCall, Miller, DiFate and Pesek for only \$25.00; *Mini-Series B*—includes print #'s 5-8, featuring the works of Berkey, Schaller, Davis, plus one mystery space art print for only \$25.00; *Individual Orders*—for those desiring prints on an individual basis, simply indicate the one(s) you want on the order form.



#1. "Space Station 2000"
 by Bob McCall
#2. "Exploring Titan"
 by Ron Miller
#3. "The Dream Fulfilled"
 by Vincent DiFate
#4. "Duststorm on Mars"
 by Ludek Pesek
#5. "Lightship Descending"
 by John Berkey
#6. "HZ Hercules Star System"
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#8. Mystery Space Art Print
 by prominent space artist.

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INVASION OF THE MONTH

THE HUMANOID: JAWS FROM SPACE

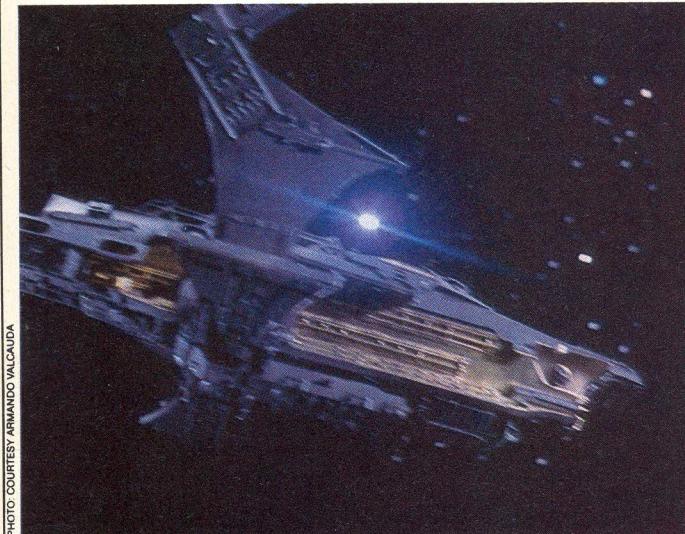


PHOTO: COURTESY ARMANDO VALCAUDA

One of Armando Valcauda's model spaceships for *The Humanoid*.

Richard Kiel, who achieved fame on the screen as James Bond's main pain, "Jaws," will bring his seven-foot-plus talent to theaters across the country this summer as the lead alien in *The Humanoid*, an Italian science fiction opus. Directed by George B. Lewis, the English pseudonym of Aldo Lado, the movie concerns the attempts of towering Golob (Kiel) at coming to terms with Earth culture. Also featured in the cast are Arthur Kennedy as Kraspin and James Bond alumnus Barbara Bach as Lady Agatha... an unfortu-

nate humanoid who meets a Dorian Gray-like demise by the film's final reel. Written by Adriano Bolzoni and Lado, the film features special effects by Armando Valcauda (of *Stella Star/Star Crash* fame) and music by Ennio Morricone, nominated for an Oscar this year for his work on the film *Days of Heaven*. Also along for the ride is a fairly unique construction, even by Italian space opera standards, called Robodog, a non-corrosive canine concocted by movie tinkerer Germano Natali.

—Joseph Kay

AUTOMATION

THE ROBOTS ARE COMING

Highly automated factories with a computer brain center and robot workers have long been a science fiction staple, and a Delphi Forecast by the University of Michigan says they will soon be a reality.

Based on a survey of the Society of Manufacturing Engineers, the Forecast predicts robots will do half



Chaplin's idea of robotic work.

the nation's assembly line jobs by 1990, achieving nearly "human capability."

Will this lead to the dreariness and boredom human workers suffer in many science fiction scenarios of an automated society, such as in Kurt Vonnegut Junior's 1952 novel, *Player Piano*? Or the helplessness and frustration portrayed by Charles Chaplin in his 1936 film, *Modern Times*, where the Little Tramp is fed by an automated machine so he won't have to leave the assembly line for lunch?

Not likely, say the engineers surveyed.

They predict human workers, technicians and engineers will demand more challenge and responsibility on the job during the next two years. By 1990 they will ask for a 32-hour, four-day work week. In response, says the forecast, a fifth of U.S. factories will offer workers more variety and less monotony on the job by 1987.

—Allan Maurer

VISIONS

HE HAS SEEN THE FUTURE, AND, WELL...

His name is Terry Schoonhoven and he paints pictures—big ones. Most of his work—on the broad sides of multi-story buildings in California—reflects some attitude of his toward our immediate tomorrows. We'll carelessly destroy ourselves. California builders will greedily ignore the dangers of earthquakes—and we'll all pay the price. We are unable, even, to appreciate the beauty around us *today*. Tomorrow there will be no people, only the lovely, serene, empty streets.

In West Los Angeles, visitors to the post office look up at the death of their city—suggested by the remains of a quake-crumbled freeway overpass at the edge of a tranquil sea. Schoon-

hoven (and his associates in the Los Angeles Fine Arts Squad) completed this beautiful but aggravating vision one month prior to the earthquake of 1971, one of the worst in the city's history.

Who pays for these delicious panoramas of doom? The doomed, largely. City and state art councils, doling out tax funds, have underwritten much of the work of Schoonhoven and his associates—with other chunks of money coming from local merchants, organizations and individuals. Recently, according to *New West* magazine, he was awarded a grant of \$100,000 to decorate a government building in Sacramento. (That grant is now in jeopardy due to cutbacks in state government spending.)

Terry Schoonhoven is 33, a native of Freeport, Illinois, and a graduate of the University of Wisconsin. He moved to California to continue his education at UCLA—and stayed.

—David Houston

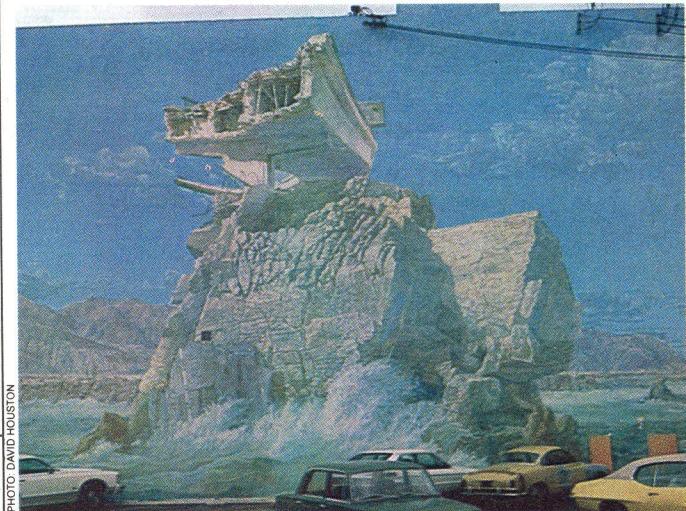


PHOTO: DAVID HOUSETON

Terry Schoonhoven's apocalyptic parking lot vision in West L.A.

CRYONICS

SCIENTIST DEPOSITS FLOWERS IN GENE BANK

Two hundred higher plant species become extinct each year. In an effort to preserve some of the estimated 350,000 remaining plants, a University of California scientist has opened the world's first flower gene bank.

Dr. Harold Koopowitz, an associate professor of biological sciences and director of the Arboretum at the Irvine campus of the university, asserts that 10 to 20 percent of all higher plant species are endangered.

Dr. Koopowitz says that although gene banks have already been developed for some agricultural crops, his is the first exclusively for flowers.

"The gene bank is a coupling of art and science," he says. "We use scientific techniques to create the gene bank, but the end result, flowers, is esthetic."

The gene bank works by freezing seeds and pollen for later retrieval. The seeds are collected, dried and sealed in a vacuum and then frozen to a point below 18° C, where they can be retained for hundreds, even thousands, of years.

Dr. Koopowitz added that it is especially critical to save as many species of plants as possible since some could possibly be significant as food or medicine sources in the future.

—Bob Woods

TELEVISION

**"COSMOS"
IN PROGRESS**

Beginning in the fall of 1980, you can take a starship voyage to a black hole, visit the dusty red plains of Mars and journey back in time to marvel at the long lost million-volume library of ancient Alexandria. And you'll be in very good company, because you'll travel courtesy of a 13-part PBS television series written and hosted by the eminently understandable scientist, Dr. Carl Sagan.

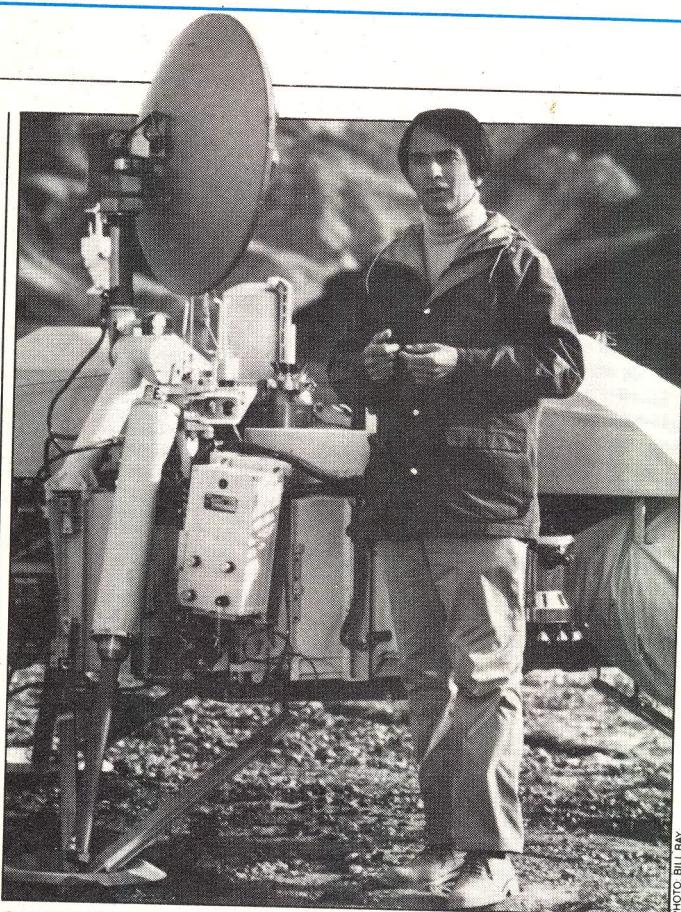
Cosmos, already a year in the making, will utilize worldwide location filming and spectacular special effects to accomplish two main purposes, according to Dr. Sagan.

"One aspect of science we hope to present is the joy," Sagan says. "Science is fun and exciting, and it can be presented in an entirely comprehensible way to general audiences, while maintaining high standards of accuracy."

Cosmos will also be devoted to communicating the powers of science for solving human problems. "Science and technology are subjects which profoundly influence our lives," says Sagan, "and today we are a scientific society without really understanding science. Our future depends on that understanding."

Far from a cut-and-dried video textbook approach, *Cosmos* promises to be a visual extravaganza. "If anybody gets bored with what I'm saying," Sagan smiles, "they can turn the sound off and still be entertained.

"We won't talk about black holes as much as we will visit them," he ex-



Carl Sagan with a Viking lander in the Mars-like Death Valley.

FILM FARM

**TATOOINE
THINK TANK HATCHED**

Those laboring under the misapprehension that the Skywalker Ranch is located somewhere on the distant planet of Tatooine should look closer to home. *Star Wars* director George Lucas has purchased the former Bull Tail Ranch near Nicasio, California, renamed it after his young movie hero, and intends to develop it into a retreat for filmmakers, writers and editors. Plans for the 1,882-acre property include both permanent and guest residences, four separate art, writing and editing buildings and a special research building for the creation of new and sophisticated special effects. The plan is now awaiting approval from the local county planning commission. —Barbara Krasnoff

**STARLOG
PRESENTS
FANGORIA,
FORMERLY
FANTASTICA**

FUTURE LIFE contributing artists such as Don Davis, Adolf Schaller, David Egge and Rick Sternbach.

Major funding for the program was supplied by the Atlantic Richfield Company, and the series is a joint project of KCET, Los Angeles, and Carl Sagan Productions. A note to students: plans are currently underway to make college credits available in connection with the series.

—Robin Snelson

For you patient readers of FUTURE LIFE who have subscribed or ordered the premiere issue of FANTASTICA, wait no longer! Scheduled to go on sale June 7, the name of this phantasmagoric magazine will be FANGORIA. The magazine will be relaunched with the same exciting editorial format and pictorial layout, only the name has been changed.

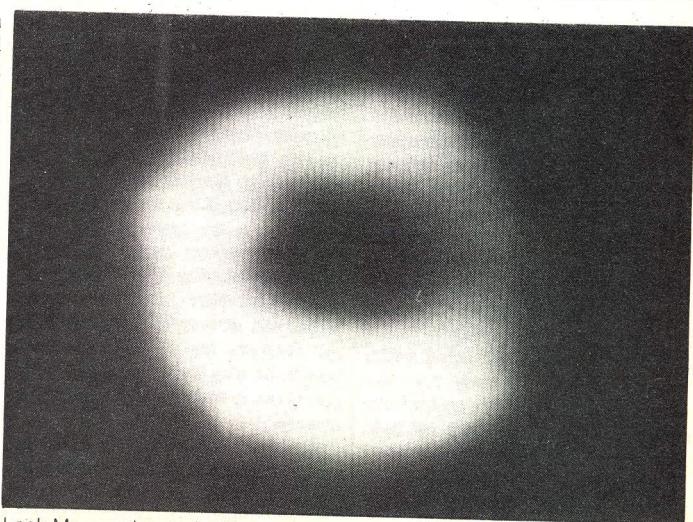
ASTRONOMY

**RINGS
WITHOUT
URANUS**

A few years ago Saturn was the "ringed planet," the only one known. Now Voyager 1's discovery of a ring around Jupiter has brought the number to three.

The second was Uranus, whose rings were discovered two years ago by astronomers watching the planet pass in front of a star. When light from the star dimmed and brightened several times before full eclipse they deduced the existence of at least five rings (three more have since been discovered). The first visual image of the rings was ob-

tained this past November by Keith Matthews, Gerry Neugebauer, and Philip Nicholson of Caltech—quite an achievement since the rings are very faint and usually submerged in the brighter reflection from Uranus itself. The trick they used was to subtract a picture of the planet, taken at an infrared wavelength where it is bright, from one at a wavelength where it is almost as dim as the rings. In effect, they "blanked out" the planet and were left with a picture of the rings alone. The picture does not resolve the individual rings, all of which are very narrow (100 kilometers at most, in contrast to the 50,000 kilometers characteristic of Saturn's rings) but it does confirm that one of the rings is lopsided, narrower near the planet than farther away, and precesses around Uranus like a cosmic Hula Hoop. —W. A. Thomasson



Look Ma, no planet: the first picture of the rings of Uranus.

HARDWARE

SUPER SOUND

In today's world of increasingly sophisticated audio gadgetry, sound recordings continue to become more and more true-to-life; so much so, in fact, that it sometimes seems very little more can be done to refine existing equipment. However, firms such as Sony and Philips have developed a completely new type of audio recording that may be as far beyond today's state of the art as the stereo was from the gramophone.

It is called digital recording, and the basic difference lies in the manner in which the sound is actually transferred onto the disc. In the present method, called analog recording, the sound is impressed onto the disc physically via the record's grooves (or, in the case of a tape recording, via magnetic patterns on the tape). No matter how elaborate the equipment used in recording and playing back the sound, there are always distractions present: nonerasable background noise, the sound of the needle against the record, distortion at higher volumes.

However, digital recording uses a more futuristic method of capturing the music. Rather than impressing the soundwaves onto the disc, it encodes them numerically via computer (thus,

"digital" recording). The codings are in binary form, and are laid out on the disc in the form of "bits," which consist of either a flat surface or a microscopic pit. These bits are read by a laser signal detection system and reconverted into the original music. The result is truly remarkable fidelity. Since there is no actual contact with the record, no machine noise conflicts with the sound. Neither scratches, dirt nor cookie crumbs will mar the recording. And because the digital system is so precise in its translation of the sound waves, distortion is practically non-existent.

Sound exciting? Perhaps—but, as with all new developments in a heavily competitive industry, there are problems.

Let's take two of the manufacturers who intend to market the digital recording equipment: Sony and Philips.

Sony's third version in their series, the DAD-IX (Digital Audio Disc System), plays a disc approximately 12 inches (303 mm) in diameter with a playing time of two-and-a-half hours. Each unit of sound information (known as PCM—Pulse Code Modulation) consists of 16 bits.

Philip's Compact Disc (CD) system, on the other hand, uses a 14 bit PCM. Each disc is about four-and-a-half inches (115 mm) in diameter, and plays for one hour.

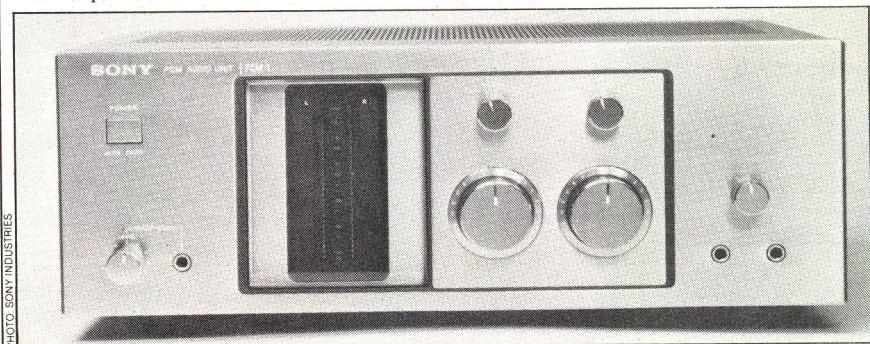
You see the difficulty? In order to successfully market this product, separate manufacturers will have to come to some sort of agreement on standards and on producing mutually compatible products. (It would have been pretty self-defeating for Panasonic to have produced cassette tapes that would only play on a Panasonic machine!) As of yet, no such agreement has been reached. These

and other setbacks will have to be overcome before the digital recording system can succeed on the market.

However, while the complete digital recording system is not yet available, consumers can now begin to avail themselves of at least some of its advantages on existing equipment. Sony recently announced that CBS Records purchased its PCM-1600 digital audio processor and editing equipment for use in the production of their master tapes. How soon recordings of this type will be on sale is not yet known.

The really eager consumer might want to test out Sony's PCM-1 digital audio processor. This interesting little gadget connects to a standard Betamax videotape recorder and will encode a sound tape using this new technology. The only prohibitive factor is its cost: A trifling \$4000.

—Barbara Krasnoff



Sony's new PCM-1 digital audio processor enables hopeful musicians and audiophiles to make tapes with perfect computerized fidelity using their home videotape recording systems.

LOCOMOTION

SLIDEWALKS AT A STANDSTILL

Moving sidewalks have been a staple of science fiction since the days of H.G. Wells. Futuristic cities such as those postulated by Isaac Asimov and Robert Heinlein featured hordes of urban commuters gaily hopping from one speeding strip to the next without batting an eyelash. These interesting forms of transportation were reckoned to be, as compared to vehicular traffic, safe, pollution-free, practical for accommodating crowds and relatively inexpensive. So what happened?

We are not without moving walkways. Many have already been installed in major airports around the globe for the convenience of passengers with heavy luggage. However, these move at approximately half normal walking speed—not exactly an exciting ride. Disneyland and

World are equipped with their WED-way PeopleMovers, which allow people to board slowly moving open cars via an intermediary circular turntable. However, these are more of a novelty than a practical means of transportation.

Last year, the National Technical Information Service issued several reports on the AMWS—Accelerating Moving Walkway Systems. These walkways are being designed to carry masses of people short distances by allowing them to board a slowly moving belt, gradually increase to a pace about twice normal walking speed, and then slow down to facilitate exit. Along with an extremely detailed report on various companies which are now developing AMWSs (none of which have been judged ready for public use, although a few are close), the booklets feature interesting examples of why we are not now navigating city streets on these mechanical marvels.

To begin with, the type of walkway which features several strips moving at various speeds is, according to the reports, quite passé. (While the image

of a typical SF hero jumping from strip to strip may be thrilling, just imagine trying to navigate a baby buggy across one.) Instead, companies are concentrating on walkways which, through interlocking "steps" or grills, speed up and slow down at certain points without any movement on the part of the pedestrians.

This system has developed several non-technical problems which will have to be ironed out before they can be introduced on a large scale. Most prominent of these is a phenomenon called "bunching," which would tend to occur at the end of the ride. Since the platforms of these walkways are structured to "stretch out" at top speed, people who were formerly standing, say, two feet apart from each other would find themselves six feet apart in the middle of the ride.

They might then, naturally enough, close ranks—just in time for the walkway to reach the slowing point, contract, and place them in a situation not unlike that of commuters on the 5:05 homebound local.

Another difficulty could be the placing of the AMWS in a shopping

district. The shopkeepers who are located adjacent to the center of the walkway might not enjoy seeing all their potential customers serenely sailing past the store (there are very few walkways now in development which allow for entry and exit at random points along the route). Additionally, since few pedestrians will initially understand just how to navigate the new walkways (and since the companies want to avoid lawsuits by injured passengers), instructions for the use of the AMWSs have to be prominently and frequently displayed. So how do you accommodate the foreign visitor who may not understand English? Or the blind passenger who will need audio assistance?

These new moving sidewalks, as you may now understand, pose slightly more involved difficulties than the science fiction writers may have taken into account. But never fear: Human ingenuity, the energy crunch, and perhaps most important, the desire for new and exciting gadgetry will soon bring us at least partway into the age of the moving walkway.

—Barbara Krasnoff

MEDIA

KEEPING UP WITH THE TREKKERS



PHOTO: DAVID HUTCHISON

Mike Minor prepares to tell STARLOG tales of preproduction art.

The long-awaited *Star Trek* movie, still slated for a December premiere, is the subject of considerable attention in the next issue of STARLOG. First, there's an interview with *Trek* preproduction artist extraordinaire Mike Minor (whose original artwork also happens to grace the cover). Next, miniature model master Brick Price reveals his techniques in lighting the *Enterprise* for the film. Lastly, there's a feature on the many problems that have surrounded the production.

Besides the *Trek* coverage, STAR-

LOG #25 will also carry an insightful interview with SF author Ray Bradbury, a colorful review of the SF fantasy bronze art of Dale Enzenbacher and a guided tour of the Neil Armstrong Air and Space Museum. And for the ever-growing number of pinball wizards, #25 will give the details of an exciting STARLOG art contest featuring \$2,500 in prizes, including a new *Star Trek* pinball machine from Bally Manufacturing.

STARLOG #25 will be trekking its way to newsstands beginning July 3. Don't miss it!

TRANSPORTATION

COPPER POWER

If the prospect of paying a dollar per gallon for gasoline has you looking around for an alternate means of transportation, the Copper Development Association may soon be able to provide you with an answer. They recently unveiled their latest in a series of electric automobiles, the Copper Electric Runabout.

The runabout is a small, four-person vehicle vaguely resembling a box on wheels. It is capable of a top

speed of 60 miles per hour, and has a 70 to 80 mile cruising range. It does all this on 12 golf-cart type batteries which are located in a tray that slides out from under the front seat. Instead of visiting your friendly neighborhood gas station to refuel, you'd simply hook up this car to your house current overnight.

The Copper Electric Runabout isn't on sale yet, so it may be some time before it is a common sight on the highways. But if President Carter is adamant about his energy policy, the presidential limousine may one day be replaced by a little electric runabout.

—Barbara Krasnoff



PHOTO: COPPER DEVELOPMENT ASSOC.

Could this electric runabout be the car of a gasless future?

MISSING LINKS

RETURN OF MR. X

A French scientist working in Kenya, Africa believes prehistoric hominids somewhere between man and ape are roaming the jungle there.



PHOTO: 1977 COLUMBIA PICTURES

Man or ape? Only Kenyans and movie makeup men know for sure.

Jacqueline Roumeguere, a sociologist with the French National Center for Scientific Research, told the Agence France-Presse she has found convincing evidence the hominids exist in the tropical forests of Kenya. She suspects the creatures are similar to hominids who were living in the same area 500,000 to three million years ago.

Many Kenyans have reported encounters with the bigfoot-like creatures, and Roumeguere has collected numerous reports of these sightings. She said evidence suggests there are four different types of the creatures she calls "X." Three are tall and well muscled, the fourth is short and stocky. All, she said, are covered with gray hair.

One Kenyan said an "X" captured him in the forest and kept him prisoner for an hour. He described the creature as having the "eyes, nose, and mouth of a man. His face was not covered with hair, but his forehead was very low, rather like that of a baboon."

Roumeguere was reluctant to give specific information on the exact locations of the sightings, saying she feared the "Xs" might be frightened away by expeditions organized to search them out. —Allan Maurer

CELEBRATIONS

TEN YEARS SINCE TRANQUILITY

July 20, 1979, is the tenth anniversary of the Apollo 11 Moon landing—and a very important occasion to many people around the country. Several events are being planned in celebration. (FUTURE LIFE's celebration takes the form of a thoughtful look back by Apollo team member Jesco von Puttkamer—see page 27.)

NASA has chosen the steps of the National Air and Space Museum in Washington, D.C. for a public ceremony at 11 a.m. on July 20th. Various NASA and Smithsonian Institute officials will be present, along with the three astronauts who made the historic flight: Neil Armstrong, Edwin "Buzz" Aldrin and Michael Collins. In addition, a short ceremony may be enacted between the Apollo 11 crew and the two men who will fly the first space shuttle, John W. Young and Robert L. Crippen, depending on the shuttle's schedule.

The Air and Space Museum will commemorate the event with a special mini-exhibit on the Apollo 11 flight, which will include a videotape of the first Moon walk, photos of the flight,

equipment and other artifacts. They are also issuing a special book entitled *Ten Years Since Tranquility: Reflections Upon Apollo 11*, which, according to co-editor Richard P. Hallion, is "a series of essays and reflections by authorities in the field of aeronautics on the social, technical and scientific impact of the Apollo program."

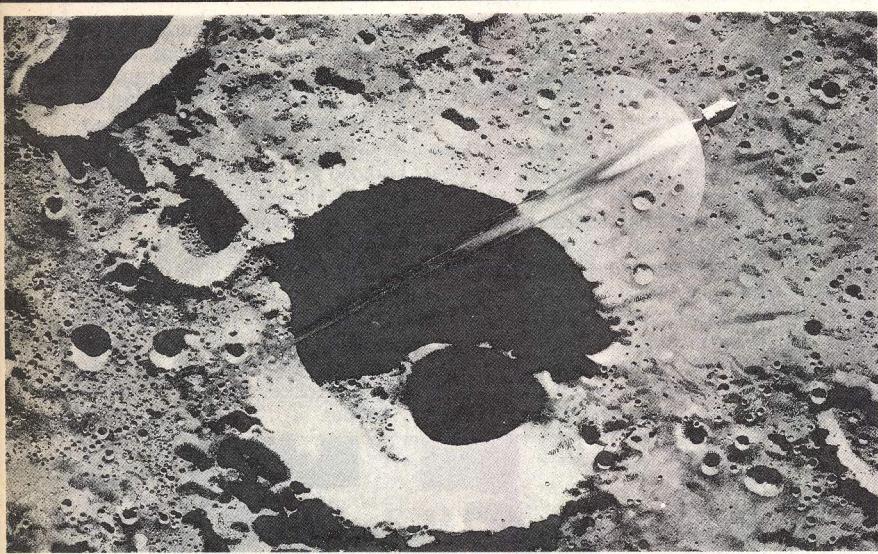
Around the country, most of the NASA bases such as the Lyndon B. Johnson Space Center in Houston and the John F. Kennedy Space Center in Florida will be having some sort of commemoration and/or open house in honor of the Apollo 11 launch and landing.

Another organization intensely interested in spaceflight is the L-5 Society. The Boston contingent has arranged for July 16-22 to be called Massachusetts Space Week. A parade has been scheduled for Saturday, July 21, and all week long there will be films and speakers scheduled throughout the Boston area. Other L-5 groups are arranging for smaller celebrations in their areas.

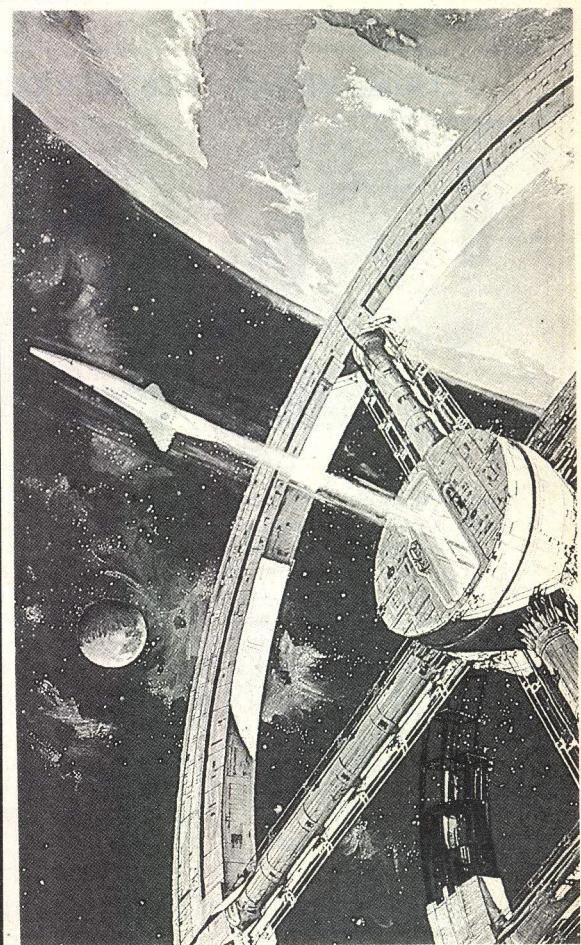
—Barbara Krasnoff

SPECIAL! LIMITED QUANTITY AVAILABLE!

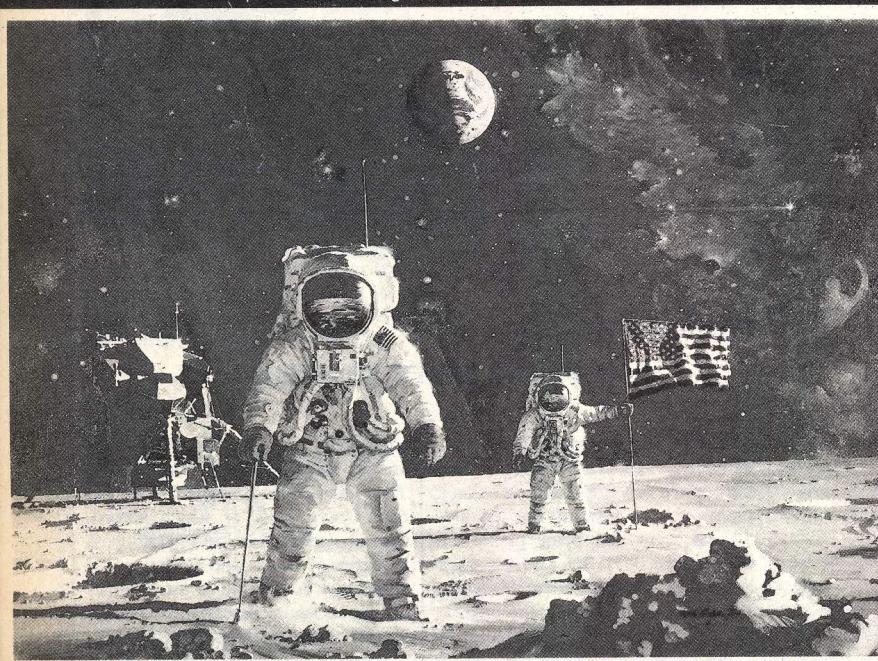
Robert McCall's Classics Now Available Individually



"Apollo VIII Coming Home" (NASA Collection)



"Space Station One" A 24 x 28 inch lithograph



"First Men On The Moon" (Private Collection)

In the future Man will use his down-to-earth technology to reach deep into the awesome infinity of outer space. Robert McCall has already been there. He has a mind that spans time and space, an eye for technical detail and the hand of a great painter. His spectacular Space Station One, created for the film "2001: A Space Odyssey," has become a collector's item and a contemporary classic.

Frequently commissioned by NASA to do on-the-spot paintings of America's ventures into space, McCall is always present for important launches and splashdowns. His oil paintings have gained international acclaim reproduced as U.S. Postage Stamps, one of which was the first stamp cancelled on the Moon, and another, his most recent, commemorated the historic

Apollo-Soyuz space rendezvous. McCall's work hangs in important museums, corporate offices and private collections around the world, and he has been honored in a one-man space art show at the Smithsonian Institution.

There is no question about it, Bob McCall is the premier space artist of this generation. Now offered are three gallery-quality lithographs of McCall's work. These are incredibly detailed, beautifully colored paintings of Man's greatest journeys. Each 24 x 28 inch lithograph is accompanied by a descriptive statement in the artist's own words. Each lithograph can be acquired for \$10. This limited collector's edition has been authorized by the artist and FUTURE LIFE Magazine guarantees your complete satisfaction.

Mail To: FUTURE LIFE MAGAZINE

Bob McCall Prints - Dept. F12
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New York, NY 10016

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Enclosed \$2.00 for postage & handling for
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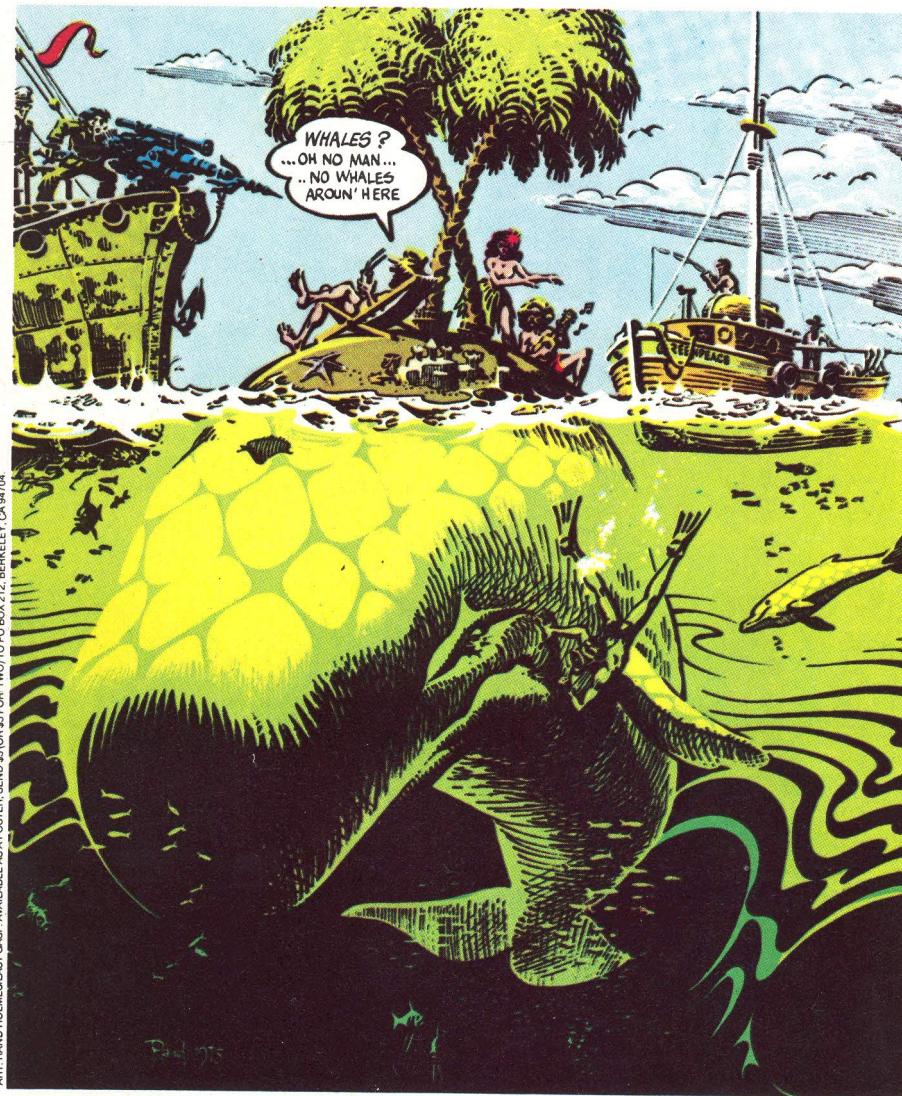
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Greenpeace—Toward Preserving the Planet



ART RAND HOLMES/LAST GASP. AVAILABLE AS A POSTER. SEND \$3 OR \$5 FOR TWO TO PO BOX 212, BERKELEY, CA 94704

A whale is killed every 26 minutes. Greenpeace is part of an international effort trying to establish a moratorium on whaling; many species are near extinction.

Earth's environment is in trouble. Human tampering with the natural balances of the planet's ecological forces is nearing the point of no return. Plants and animals are disappearing at an alarming rate. Some experts estimate that as many as 20 species become extinct annually (it used to be a few every thousand years), and human encroachment continues to wipe out natural wildlife habitats. Despite scattered improvements, industrial pollution still chokes our air and water. Unchecked deforestation threatens to transform millions of once-green acres into barren and useless desert. Cases of environmentally incubated diseases are mounting: Toxic chemical

seepage forced the permanent evacuation of Love Canal, New York; unusually high amounts of deadly mercury have been discovered beneath a major development tract in New Jersey; radioactive deposits of uranium and radium have been unearthed in downtown Denver; frightening correlations have been drawn between cancer incidence and living near highly industrialized regions. While nations debate nuclear non-proliferation, U.S. researchers study the possibly devastating effects of the nuclear tests of the 1950s. And in each of these cases, death, whether of a stream or a family or town, is the ultimate result.

Such doom-saying may be alarmist, but it's

based on fact, nonetheless. No matter how you look at it, our environment demands immediate attention. We may well build colonies in space during our lifetimes, but if we neglect our own planet in the process, it won't make much difference.

Environmentalists, those who would save Earth from its inhabitants, come in all shapes and sizes. There are little old ladies who hate fur coats and complain to their congressmen. There are congressmen who try to pass environmental laws. There are powerful environmental lobbies like Sierra Club and National Wildlife Federation. And last year, thousands rallied in support of an endangered three-inch fish and eventually halted construction of a porkbarrel dam project.

And then there is Greenpeace.

Formerly known as The Greenpeace Foundation, the group is hard to define: environmentalists, fanatics, freaks, zealots, preservationists, crazies, hippies, grass-roots activists—they're called all sorts of things. No matter, though; Greenpeacers steadfastly serve one purpose: To preserve and restore the ecological balance of Earth.

Above all else, it is this holistic vision of the world as an intricate network of ecosystems, with mankind as just another link, that sets Greenpeace apart. Their basic tenet is "to bring about that basic change in thinking toward planetary consciousness, so that mankind in the future will not have to concern itself with... the inevitable, ultimate death of an ecological system..."

Using this philosophy, combined with sound, factual knowledge of the environment, Greenpeacers literally put their lives on the line and thereby force the environmental issue down the public's throat. They have found the secret weapon, one of the most powerful ever devised—the media.

Greenpeace was founded in Vancouver in 1969, initially as the Don't Make a Wave Committee, to protest American nuclear testing on Amchitka Island in southern Alaska. Though Greenpeace actions may not have been the sole reason, the tests were quietly halted in 1972 and the island has been a bird sanctuary ever since.

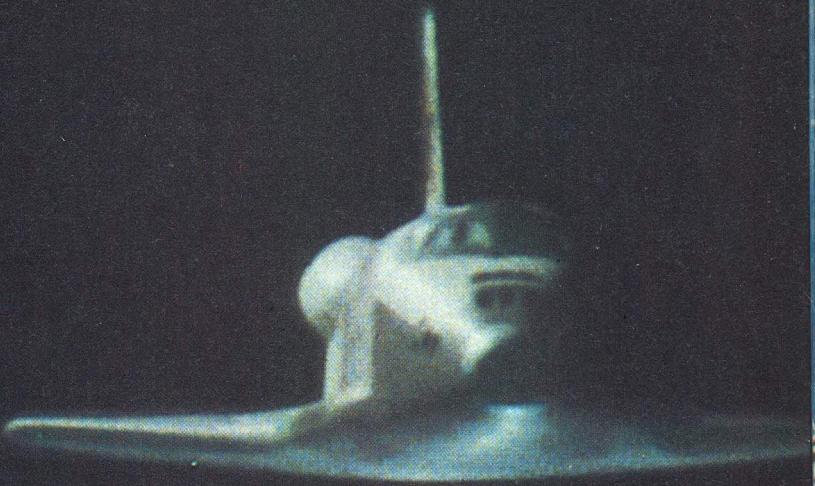
Greenpeace's anti-nuke fervor proliferated and they continued to let their physical presence at test sites bespeak their protest. At the same time, additional offices were opened around the world. Greenpeace expanded its activities to combat the slaughter of vanishing species of whales. The Greenpeace tactic for protesting whaling is non-violent yet effective: The Greenpeace ship finds the whaling

(continued on page 63)

Producer Albert R. (Cubby) Broccoli relaxes in a New York restaurant and reflects upon his career. "I guess you could say that I'm obsessed with James Bond," he admits. "But he has a lot of fans all over the world just as obsessed as I am. So... why not keep him going?"

Broccoli has been keeping agent 007 "going" on the screen since 1962 when the first Bond adventure, *Dr. No*, was released. In his two-and-a-half-decade association with the famous Ian Fleming hero, Broccoli has sent Bond traipsing all around the world. This summer, he is sending the intrepid secret agent out of this world, literally, in *Moonraker*, the spaciest Bond film to date.

"The premise of the movie is not science fiction," Broccoli is quick to point out. "It's science fact. According to the scientists at NASA, everything that we have in our picture can actually happen in the very near future,



Moonraker

James Bond Takes To Space

In *Moonraker*, stalwart 007 fights out-of-this-world villainy with NASA's blessing.

not a couple of centuries from now."

Indeed, *Moonraker*'s scenario reads like a blueprint for a NASA do-it-yourself space program kit. The film opens with the sky-jacking of the U.S. space shuttle *Moonraker* from the back of a 747. James Bond (Roger Moore) is summoned by his boss, M (Bernard Lee), and told to solve the mystery of the missing space vehicle.

Eventually, the trail leads him to millionaire space enthusiast/demented genius Drax (Michael Lonsdale), a soft-spoken chap who plans to start a new Master Race through space breeding. To further his aims, he has constructed a space station far above Earth, and a fleet of space shuttles to make the planet-to-orbit commute. Of course, Drax's plans call for the elimination of the human race as it is known today, a plot which upsets Bond somewhat.

When Drax, his henchman Jaws (Richard

Keil) and his space race flee to his floating fortress, they are pursued by Bond, CIA agent Holly Goodhead (Lois Chiles) and a fleet of astronaut Marines. The finale offers a spectacular vision of space warfare that should please both science fiction enthusiasts and John Wayne fans.

Yet, despite *Moonraker*'s spacier elements, all concerned insist that it is not, repeat, *not* a science fiction picture. "We were after accuracy," Broccoli explains, "not *Star Wars* fantasy. We attended an aerospace seminar in Houston where all these immensely talented scientists explained to us that, eventually, we will have cities in the sky...space colonies. After visiting places like Rockwell International and Ames Research Center, it occurred to us that the reality of what they were trying to do was here *now*. It's just a question of money, of funding, to get things going. The technology certainly

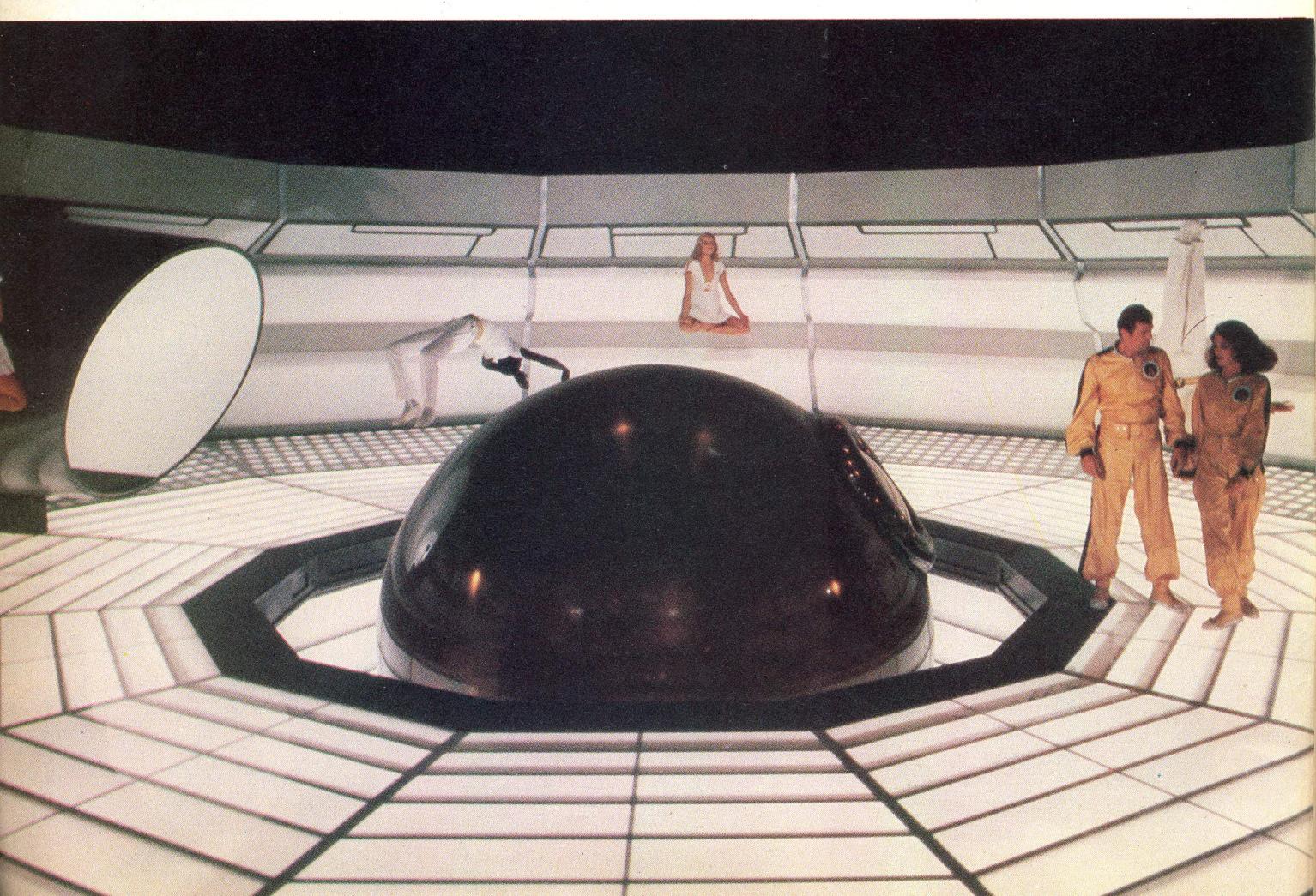
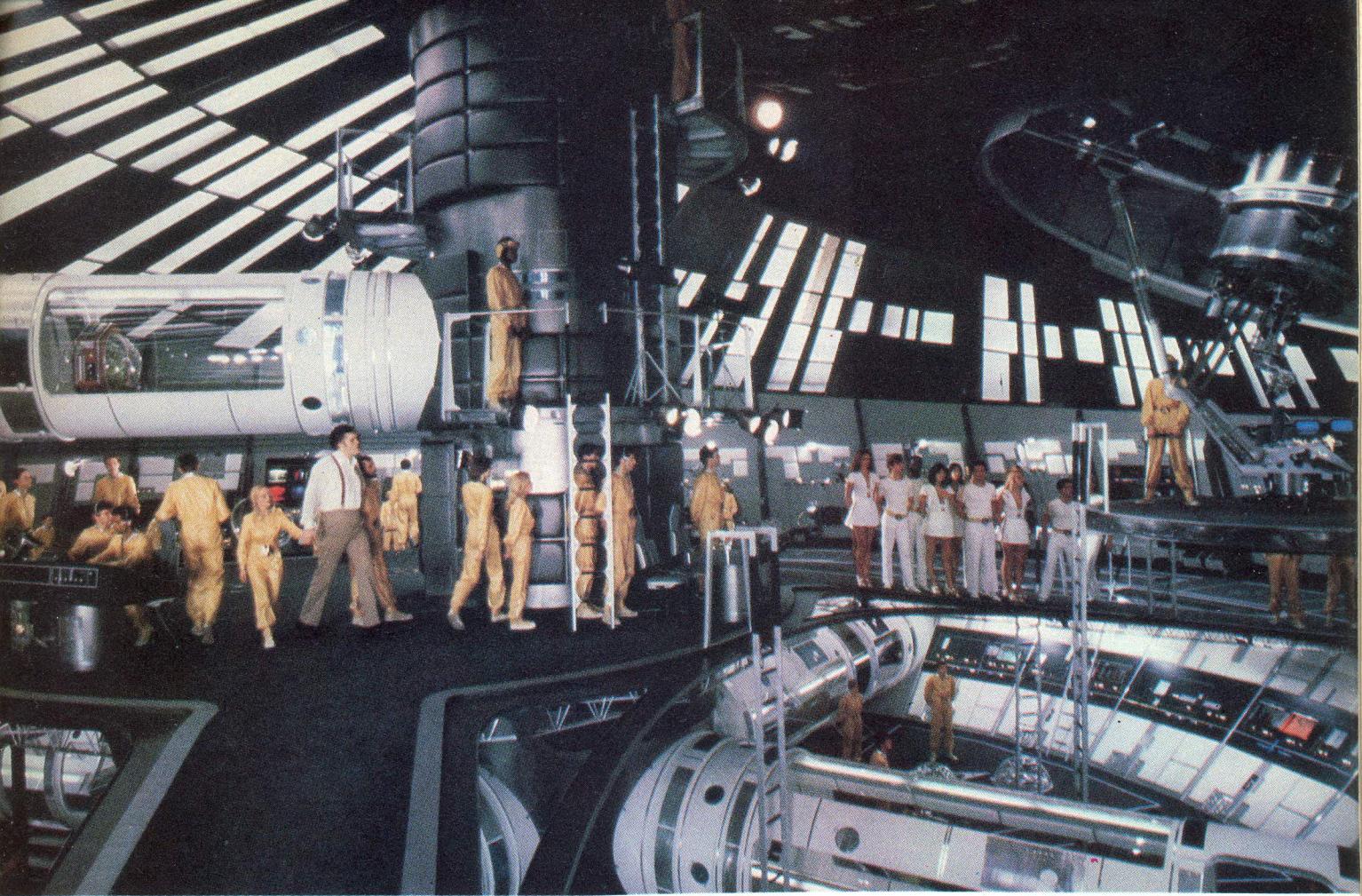
isn't lacking. They know they can put a space colony up there. Hearing all these scientists speak gave us the idea that there was a real story here."

In order to fit the NASA lighter-than-air slant in with the earthy Bond motif, Broccoli went back to Ian Fleming's 1955 novel *Moonraker* for inspiration. The original book boasted a decidedly 1950s plotline. Sir Hugo Drax sought to destroy all of London with a few privately owned nuclear missiles. Today, in a world where A-bombs can be cooked up on college campuses, the original Drax's villainy would seem like small potatoes. But his intrinsic evilness appealed to Broccoli.

Calling in director Lewis Gilbert, production designer Ken Adam and writer Christopher Wood (the team that made 1977's *The Spy Who Loved Me* such a box office smash), Broccoli began to brainstorm. One part

By WALTER MORTON and JOSEPH KAY

RAKED



NASA. Two parts skullduggery. Within months, *Moonraker* was born.

Building the Future

The finished script of *Moonraker* presented the filmmakers with a horde of mind-boggling problems. Reading about private space projects, shuttle-jackings and secret laboratories was one thing. Seeing them before the camera was another. The plot called for science fictionsque designs not only aboard Drax's orbiting lair but for equally futuristic Earthbound locations as well. Ken Adam, a veteran of eight Bond films, took the challenges in stride.

"I spent some time at NASA in Houston, at Ames Research and various other places," he says. "They were extremely obliging and gave me a lot of factual information, photographs and actual schemes. But then," Adam confides, "I treated the film more or less the way I treat anything, even a period film. I put all the research I'd digested aside and just let myself go.

"Somehow, in every Bond film, I get influenced by a different *shape*. In this film's design, it happened to be tubes. When I saw the space shuttle cylinders at NASA, I suddenly found that a lot of my sets could have a tubular feeling about them."

One of Adam's greatest challenges was the creation of Drax's spidery space station, a bizarre structure that called for science fiction to meld with fact. "It was fun designing that," he states. "Because every time I see an existing piece of equipment, I always think that maybe, in the film, I can do better than that. At NASA, they showed me a lot of artists' concepts of future space colonies. They were exciting in terms of reality but they weren't exciting in terms of filmmaking. By that, I mean that I could have used the traditional space wheel concept which Kubrick used in *2001* and that would have been valid scientifically. However, when you get inside of it, it's like filming inside a large bicycle tire.

"Another type of space station I saw was a series of cylinders. That sent me going. Using that principle, I started off designing a *mobile*, a hanging structure. I used cylinders of varying lengths and angles and combined them with various spheres... the central sphere was the zero gravity room... before adding satellites. The station was made to rotate, to create artificial gravity. Whenever it moves or turns, the camera gets a different aspect of it.

"To keep the interior set from getting dull, I decided to treat all my circular planes in a non-concentric way. The central lift shaft was therefore not in the center of the set. The sides of the set sloped down in a 'forced perspective.' I made the giant telescope as a compositional feature. Then, I broke the whole space of the setup with a series of horizontal tubes and one, big vertical tube."

Left, top of page: The interior of Drax's space station. Left: In a scene deleted from the finished film, Bond and Holly Goodhead explore the light gravity chamber where Drax's master space race engages in close encounters of every possible kind.

Drax's earthly lair presented just as many problems for the talented Adam. The script called for the villain to seek refuge near the lost city of Tikal in South America, where he hides his scientific villainy beneath the protective walls of an ancient pyramid. Thinking quickly, Adam managed to combine ancient architecture with futuristic scope. "I took every opportunity to use ancient Mayan accents in those interiors. The control room had all sorts of read-outs which I treated like a gigantic translucent pyramid with gun metal structural numbers. The pyramid shape was, again, governed by the Mayan pyramid design. All in all, this film has been the longest and most complex Bond I've ever worked on. It's also the most spectacular."

Liftoff, Let Down

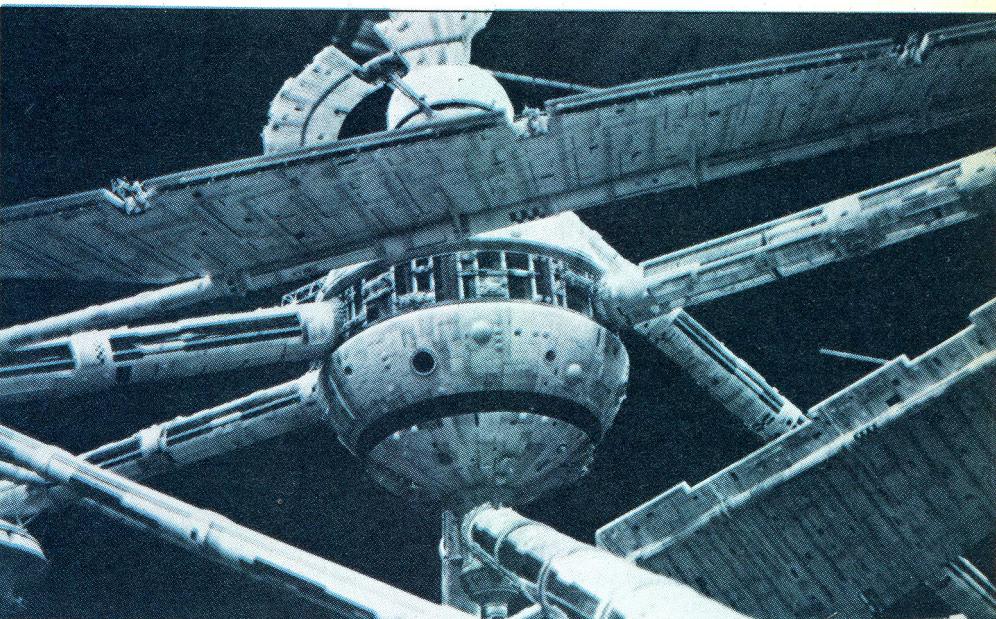
While Ken Adam concentrated on larger-than-life sets, special effects wizard Derek (*Superman—The Movie*, *The Spy Who Loved Me*, *Space: 1999*) Meddings concen-

trated on the black of outer space."

During both pre-production and actual filming, Meddings was shadowed by NASA consultant Eric Burgess who is, in Meddings' opinion, "simply wonderful to work with and very sympathetic to our plight. When he first showed up on the set, we hadn't started shooting yet but had all the designs and effects in storyboard form. He went through them all and either okayed them or tossed them out. The ones he tossed, we re-did.

"Eric remained on the set during all of production just to make sure we didn't go balmy with the special effects and wind up doing crazed things just because we wanted to do them. Everything we did had to look right. Real. He viewed the rushes with us every day and, during shooting, if we tried to pull a fast one, he'd be there to say 'That's impossible.' We did everything he suggested because we wanted our footage to be authentic looking."

Meddings strove for authenticity in every area but out-did himself when it came to



A close-up of Derek Meddings' space station miniature, over 13 feet in width.

trated on miniature effects that, on screen, had to look larger than life. It was Meddings' job to construct a fleet of space shuttles and a miniature space station and, then, make them soar through space.

"It was quite a tall order to fill," the genial Britisher admits. "You see, the picture is science fact, not science fiction, so our effects had to be very, very realistic."

After personally doing extensive research at NASA's Ames complex, studying every aspect of the American space shuttle program, Meddings got down to work. "Basically, our space shuttles are of the American design, although we have changed their color a little bit. We kept the body white, but the real shuttles have a black underside and what they call raccoon noses. Well, we've changed the bottom color from black to brown. You see, most of the time they're on the screen, our shuttles are shot against a space sky. We didn't want them to look as if they had a weird figure, with the bottoms blending in

building and operating the various space shuttles. "We constructed quite a few models at various scales. We had two shuttles that were six feet in length. (Fairly large for a miniature.) We also had one two-foot model and a fleet of shuttles constructed at various sizes that we used for long distance shots. For the actual liftoff scenes, we used models about five feet in length."

For Meddings, the liftoff scenes were the most important in that they had to perfectly mimic the scenarios offered by Burgess. Filming a miniature rocket blasting off is always a difficult task to pull off realistically on screen. The smoke, the thrust, the exhaust flames have to give the illusion of size and power while remaining true to scale.

Meddings took it all in stride, however, coming up with a series of totally realistic liftoffs. They did cause a few problems, however. "It's the same old problem that everybody has when you're trying to create a realistic amount of intense heat in a model,"



On the set in Europe, Ken Adam, Cubby Broccoli and director Lewis Gilbert ponder the fate of agent 007 as Bond zips from Venice to Rio to Drax's outer space sanctum.

he says. "It has to be powerful, yet not intense enough to actually do harm to the model, which is flammable. To do that, we made up special 'motors.' They're called 'motors,' but what they are is a very powerful firework: a combination of magnesium and gunpowder. When ignited, they burn at a very high intensity. We just crammed the tails of the shuttles full. In order to save the model, however, we constructed the burning end out of metal: lightweight aluminum.

"Now, each of our motors, these gunpowder-magnesium engines, had trick releases on them. Immediately after we had shot ignition, a technician would run quickly to the scene, wearing asbestos gloves and goggles. He'd pull a pin on the side of the shuttle not facing the camera, which would release the spent motors from the bottom of the model. We had a metal tray underneath the shuttle to catch the things so we wouldn't burn down the studio."

Usually, Meddings and his crew carried off these scenes with unerring accuracy. But fireworks can be tricky to handle. "According to plan," he smiles, "the burning motors would all just drop into this pan and we could re-use the shuttle model safely in another scene. Unfortunately, one day we were faced with a lift-off shot trickier than most. We had to take the shuttle up through a set. That made things very complicated for us and hard for the technician to get to the shuttle right after lift-off. But, we rehearsed it and worked everything out so he could get to the model in time and pull the pin, releasing the motors harmlessly. After the actual shot, however, when he ran up to the shuttle, one of the motors decided that it still had a bit of life left in it and let off an extra spurt of flame. The technician jumped back and missed the release pin. The shuttle, of course, caught fire. We wound up with a very badly damaged model and quite a bit of smoke."

In another scene, Meddings had to suspend some 50 "astronauts" in space for a laser gun showdown. Dangling from wires, the space soldiers shot it out while harried

crews worked their harnesses. "I'd like to say that it was hard to do that shot," Meddings laughs, "because it would really make me sound like a genius. It wasn't though. It's part of my job. You learn how to pull these things together as painlessly as possible."

On Earth, however, Bond's travels caused quite a bit of pain to his peers. During the

creative crew managed to make it through their hectic shooting schedule (12 months for the entire film) without a hitch; coming up with some of the most surreal Bond scenes ever, including zero-g space fights, arctic shuttle liftoffs and free-fall battles.

Derek Meddings is justifiably proudest of his space shot contribution. "We had a group of people come over from the Ames Research Center to see the film," he beams. "They were very excited. They said it was the best outer space footage they had ever seen. So, now, we have sort of an official seal of approval stamped on it. That pleased me very much. Here were a group of people who do



Top right: Lois Chiles and Roger Moore take a breather between daring escapes. Above: Special effects wizard Meddings with his *Moonraker* storyboards and designs.

time that Adam and Meddings conquered outer space, Broccoli and Lewis had their hands full fighting off Mother Nature as the cast location-hopped from France to Venice to Rio de Janeiro. "We moved into Venice to shoot and they had a flood!" Broccoli recounts, seemingly still amazed. "There was three feet of water in St. Mark's square! We had to walk around our hotel wearing boots! Then, we moved to Rio. They have record rain. The first night of our shooting, we were going to have 500 extras show up and recreate a local carnival. Of course, that day had to see the first bus strike in the history of Rio. So, we had to go out and pick up 500 people and drive them to the set ourselves."

Amazingly enough, Broccoli and his

this sort of thing for a living paying us a compliment," he muses. "And we only play at it."

Producer Broccoli is thrilled with the entire, futuristic romp. "It's the biggest Bond film yet," he enthuses, "and the best. Even if this wasn't a James Bond picture, if this was a Joe Smith picture, it would still be a hell of a movie."

A slight frown creases Broccoli's face as he catches himself describing the outer space adventure in superlatives. "Of course," he adds, "*Moonraker* has presented us with a slight problem. To date, we've taken Bond everywhere on Earth. We've taken him beneath the ocean, above the Earth and, now, into space. After *Moonraker*... where do we go from here?"

Five years ago, author Robert Silverberg did the unthinkable. After a successful 20-year career in science fiction, he quit. The man responsible for such works as *Tower of Glass*, *Downward to the Earth*, *Son of Man*, *Dying Inside*, *The Book of Skulls*, *To Live Again*, *Hawksbill Station*, *Nightwings* and *A Time of Changes* decided that writing wasn't paying off for him. He felt ignored, and he realized that he hadn't written that all-important "big book," that instant classic which would bring him mainstream fame.

Today, Silverberg is writing once again. After a half-decade hiatus, he is working on an epic adventure called *Lord Valentine's Castle*, reputed to be the author's long awaited "big book." Certainly, the publishing industry is treating it as such. Last year,

Silverberg became the proud recipient of the highest advance ever paid a science fiction author for a single work. The as-yet-to-be-completed novel garnered a hardcover bid of \$127,500 from Harper and Row, netted a 15 percent royalty and has been promised an advertising budget of \$35,000. "It's a major event," Silverberg admits, "and I haven't even finished it yet."

Seated in the garden of his California home, the bearded writer is more than candid about his highly touted return to science fiction. "I think everybody senses that this is a breakthrough or break-out book," he explains. "Everybody has known for a long time that I write well. That I write clean, comprehensible prose. That I tell an interesting story. As far as *Lord Valentine's Castle* is concerned, I wrote an 18-page outline for

submission. And what that outline evidently said to the editors was 'Hey, he's finally going to get it together. He's going to give us that intensity of emotion and that cleanliness of prose. And he's going to tell a story that a million people will want to go out and read.'"

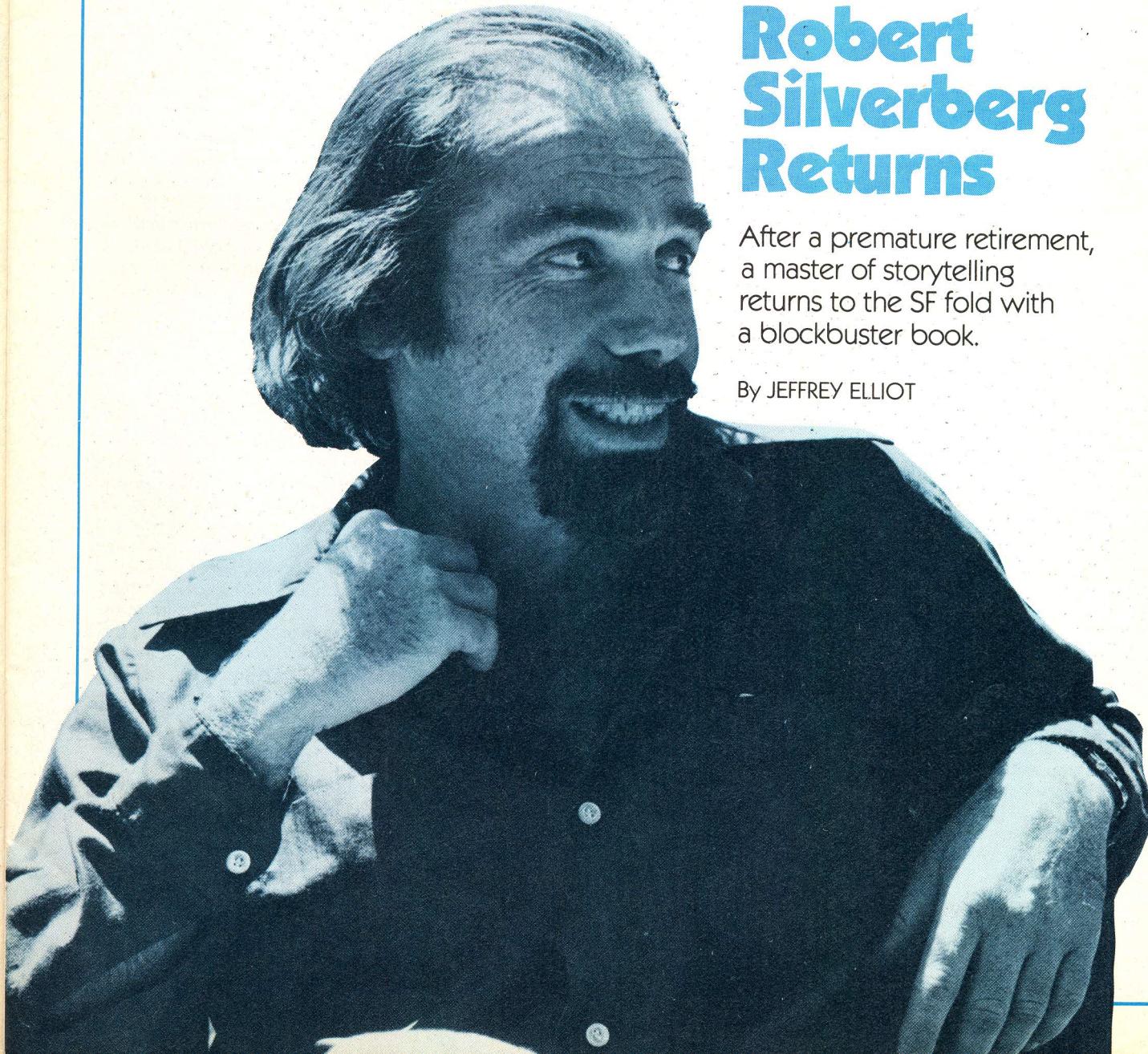
Five years ago, however, Robert Silverberg was somewhat less optimistic about both his prose and the audience it reached. "I had been writing on a full-time basis for almost 20 years at that point," he states. "And, of course, I had been writing very prolifically. I was very tired. The words were swimming on the page, no longer making sense to me. However, when I did retire, the element of fatigue was not uppermost in my mind.

"In 1974, as you know, we were going through an economic recession, coupled with the crisis that Watergate precipitated. That

Robert Silverberg Returns

After a premature retirement, a master of storytelling returns to the SF fold with a blockbuster book.

By JEFFREY ELLIOT



situation bore on me personally when all of my books disappeared from print precisely at the time when I needed the emotional support of having those books stay on the shelves. When I approached the publishers, who were having their own economic problems, they showed very little interest in re-issuing the books.

"At the same time, they showed a great deal of interest in books that I regarded as trivial by comparison. So it was very easy for me to say, with a very sulky plague-on-all-your-houses attitude, to hell with it. I'm going to tend my garden and never write again. Well, it turned out to be a premature kind of sulk, because very shortly my books began coming back into print as part of the normal publishing cycle. Now, wherever you look, you see dozens of Robert Silverberg novels. In my weariness, I had simply misread a short-term phenomenon for a permanent trend."

Silverberg admits, however, that he was drained physically as well as emotionally. "The element of fatigue was certainly a major factor in my decision," he says. "I haven't written now in over four years. I needed, evidently, a long period in which to recharge my batteries. I merely found various superficial pretexts to justify the fact that I was really weary of sitting at the typewriter and making up galactic epics.

"I certainly intended my retirement to be permanent. In fact, until I decided to break it just a few months ago, it was still permanent. Besides fatigue, there was another problem I had to work my way through. The books that I had been writing in the last few years before I quit were becoming increasingly literary in tone, increasingly challenging to write, increasingly difficult to read. I had been getting more and more away from the notion of science fiction as story telling. I had begun to think of myself as a sort of James Joyce or Marcel Proust.

"That is a good thing for a writer to do; to stretch his reach as much as possible. But I found that I was stretching myself beyond the capacity of most of the audience; that I was heading right down a dead end, as happened to Messrs. Joyce and Prouse, where I couldn't carry the theory of what I was doing any further. I wrote myself right into silence."

Coupled with his literary problems, Silverberg found that science fiction writing was wreaking havoc on his personal life. "It seemed to me," he reveals, "that when I quit in 1974, my writing was simply getting in the way of what I really wanted to do. When a writer reaches that point, the wisest thing for him to do is stop writing. I've gone through that phase now, which is why I'm writing a new book.

"At the time I quit writing, I voluntarily abandoned a very successful career, despite the fact that many of my books were out of print. I had won all sorts of awards and publishers were still courting me for new novels. To be able to walk away from all that and say, 'I don't want this. I don't need this.' gave me a great rush of strength and security.



"... The fact that I had quit so publicly, very unique in writing and certainly in science fiction, focused a lot of retrospective attention on me. It was almost a posthumous feeling for me. People were summing up my career, concluding that, yes, I did write a number of interesting books."

The notion that I didn't need to be Robert Silverberg, world-famous science fiction writer, to support my own identity, that I could just shrug and play with my cacti in the garden and be myself was an important and interesting thing to discover. In addition, this retirement period gave me the opportunity to go out and interact with people.

"Writing is a very solitary business. You sit at your desk and type and you're all alone while you're doing it. It consumes an enormous amount of energy. I'm basically a pretty solitary man to begin with. When I've embarked on a major project, I get three times as solitary. So when I stopped writing, I was able to get out and be with people in a way that I hadn't managed since my adolescence. I started writing when I was still in college. I had those 20 years of very active writing behind me and I was still a relatively young man. That's one thing that pleases me and surprises me. It's nice to meet people who have been reading me since they were in the seventh grade and have them discover that I'm not 64.

"My whole reputation in science fiction is really based on the things that I've done since the middle 1960s. I proceeded, then, to get far more elitist, more and more literary, to the point of no return, to the absolute vanishing point of my career. After my brief retirement, the book I will return with will be far more accessible, far more human, far more concerned with matters of narrative rather than style. I don't see this so much as a selling-out of my former principles, but rather as a logical outgrowth of my own self-examination in terms of my relationship vis-a-vis my readers. I think I wandered into a very rarified aesthetic realm and now I've wandered back."

During the last days of his self-imposed exile, Silverberg felt the yen to jump back into the science fiction swirl. At first it was a faint hint of frustration, of boredom, then it grew in a very slow, natural manner. "I didn't set out to create a commercial come-back," Silverberg states. "I didn't feel pressure to return to writing as much as I felt the logic. I felt that if I came back at all, it shouldn't be with something piddling. I just might as well stay in my garden and play with my cacti as write a nothing kind of book. When I decided to resume writing again, it came out of nowhere. I was out by the pool pruning a plant

in the garden. Suddenly, there was a story idea in my head... which is not an amazing event for somebody who has written as many books as I have. But, then, there was also something inside me saying 'write it.'

"I came into my office and jotted down a few lines about the book on the back of an envelope. It was just the barest sketch of what the book would be. I studied it for a moment, scratched my head and said, 'I really want to do this book.' Then, I asked myself the big question... namely 'Do I really want to get back into that jungle?' And the answer came back, 'Yes.'

"I'm writing *Lord Valentine's Castle* now, making no commitments beyond that. Thus far, the book is coming a lot more easily than the last few books I had done. Those last few books were written against terrible inner resistance. The planning of *Lord Valentine's Castle*, though, came with great ease and this is reassuring to me. From the original one-line story idea to the 18-page outline which followed, the entire effort was done without hindrance. An interesting thing happened in the course of planning the book, which reminds me of the greatest joys of writing. I had written a complete draft of the outline and thought it was quite satisfactory. As I was retyping the outline to send to my agent, I came to the final sentence of the book and discovered that something was wrong. Indeed, a major plot transformation occurred right at the typewriter while I was doing a simple typing job. It's that sense of surprise, of discovery, that makes writing so delightful."

When Silverberg decided to return to the science fiction fold he found, much to his surprise, that he was a lot more popular than he had dreamed when he retired. "The fact that I had quit so publicly, very unique in writing and certainly in science fiction, focused a lot of retrospective attention on me," he recounts. "It was almost a posthumous feeling for me. People were summing up my career and, in the process, concluding that, yes, I did write a number of interesting books. I also got some perspective on my career during the layoff. I had written all those books, some 15 in all, between 1966 and 1973. That's almost two books a year, which is an awful rush of stuff for people to digest in such a short period of time. During that period, I used to wonder 'Why haven't people noticed what

I've done?"

"Well, they did notice and there's a whole shelf of awards in my study to prove it. But it didn't seem to me as though the accomplishment had really sunk in. Well, after a few years in the garden to look at things more quietly, I realized that I simply asked too much of people. That they couldn't possibly absorb all of these books in so short a span of time. Now that they're being reissued gradually, people are picking them up and saying, 'Far out, this guy has something. I want to read his other books.' The effect has been one of delayed impact. It was as though I had hurled all these skyrockets out and expected them to dazzle everybody all at once. All it did, though, was blind everyone. Now, people have had the chance to evaluate and understand. When I told publishers I was about to write another book, the response was gratifying."

The monetary offer from Harper and Row was most gratifying to Silverberg, who states, "It's a tremendous vote of confidence on their part. No hardcover publisher has ever risked that much on a science fiction book.

Since the book isn't actually written at this point, Silverberg is not about to give away any intricate plot details, although he admits, "It will be what I think of as a basic science fiction experience. It will take the reader through strange places and show him wonders and marvels. That's what I always turned to science fiction for, beyond any other factor that it has to offer. In writing the book,

Says Silverberg: "It seemed to me that when I quit in 1974, my writing was getting in the way of what I wanted to do."

it's important to me to experience these wonders and marvels simply to sustain my own interest in the project. The idea of *Valentine* promises that.

"It was a trip that I wanted to take. I saw that, if I did embark on this voyage, I would have one hell of a good time. Therefore, it's only logical to conclude that those who come along with me as readers would also have a good time. I could see immediately that this was a big book, a big audience and big money which, of course, I'm not averse to. It was the right kind of book to do... not simply one more in a series of books of the kind that I worked so hard on in the 1970s before I gave out. It's a book that's brand new, both in style and content."

But what about the plot? "Well, at its simplest level, it's about a man of power who has lost his power, a disinherited prince, who embarks on an incredible odyssey of self-discovery and eventually goes on to try to regain his lost power. It's basic, prototypical fiction. Beyond that, I would rather not say much more about the story. I don't want everybody to feel that they've already read the book by the time I finish writing it."

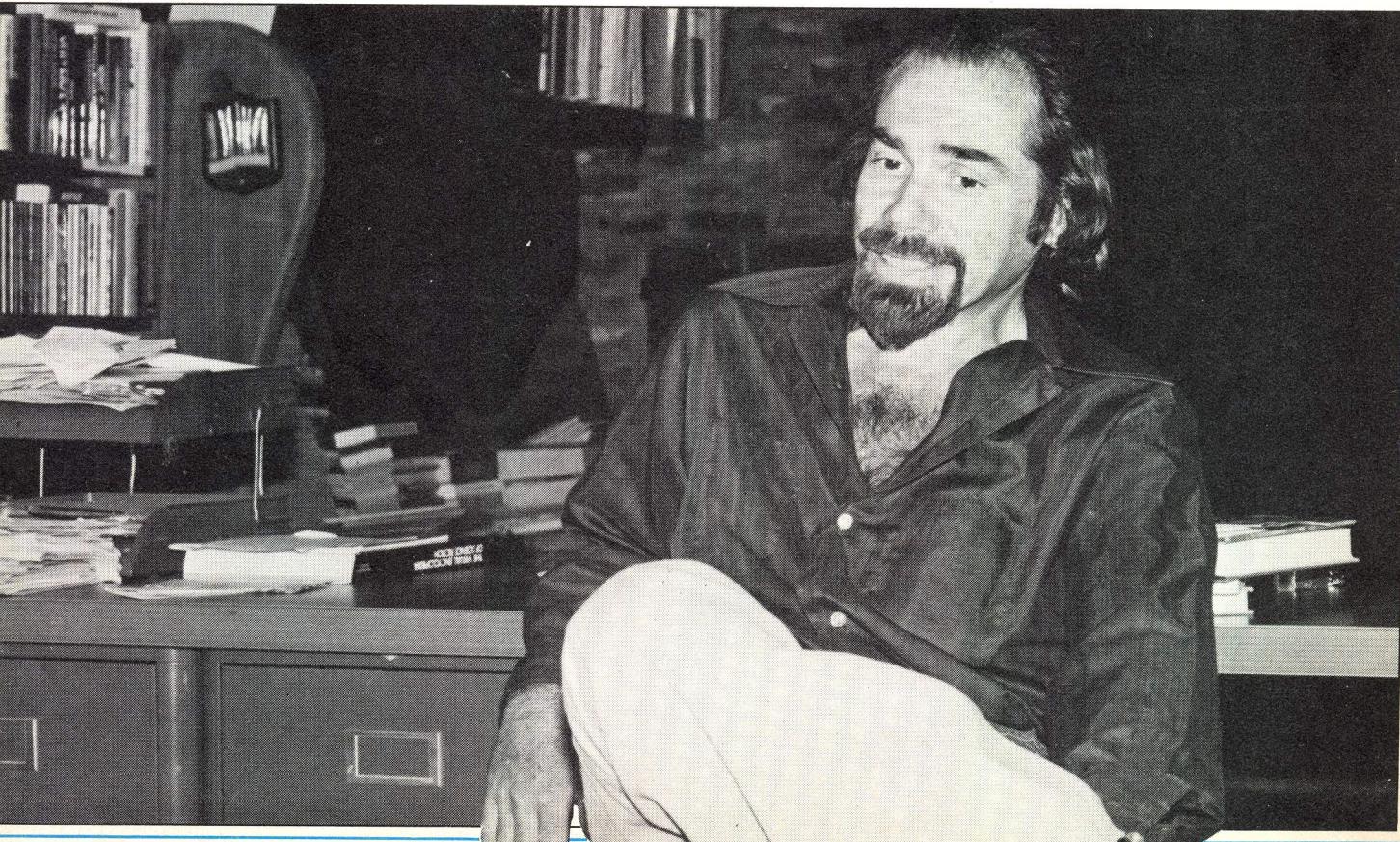
If Lord Valentine's plight sounds vaguely similar to Silverberg's own traumas of five years ago, it's no accident. "I suppose the book would have to embody my own search for meaning and purpose whether I intend it to or not. I didn't approach this book with that idea in mind, though. The book, I think, will appeal to a very broad segment of the science fiction audience. The range will include the reader who saw *Star Wars* six times and is just now finding his way into science

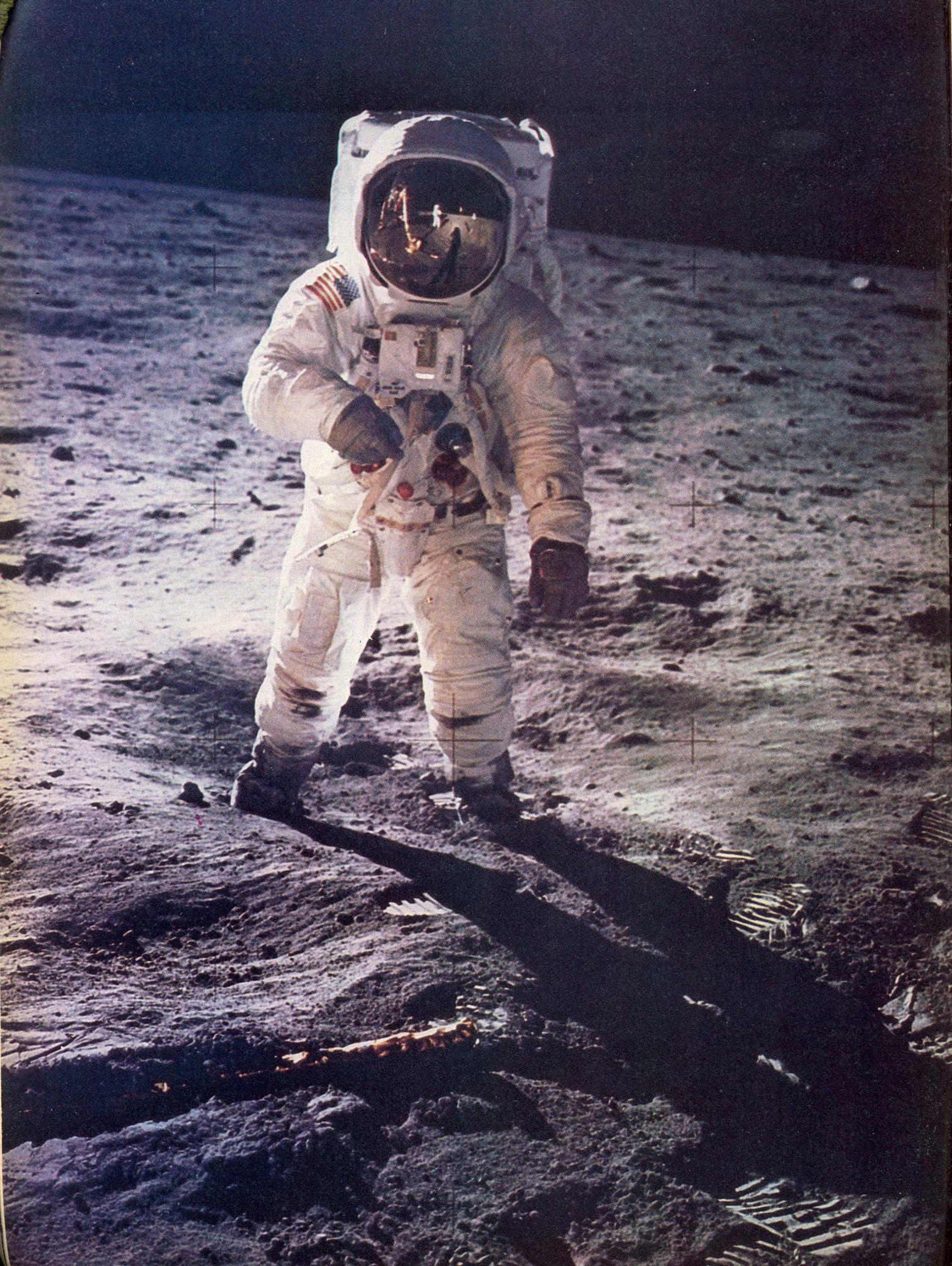
fiction and the reader who has been reading Zelazny, Ellison, Moorcock and Silverberg for the last 15 years.

"Prior to this book, my readership consisted of a very narrow band of science fiction audience. It was largely a college-educated, literary-oriented, sophisticated segment of the science fiction audience. These were people who were turned on by the imagery and the intellectual excitement of science fiction, but who also wanted the advanced stylistic amusement that typified my writing, as well as emotional intensity and human interaction which are often lacking in science fiction. I want to keep those people as the nucleus of my audience, but I would hope to reach beyond them now. I want to go on serving their needs but not their needs exclusively."

Currently up to his neck in manuscript pages, Silverberg is delighted to be back in the science fiction swim of things. "Science fiction excites me today," he reflects, "the same way it did when I was nine years old. It shows me things I couldn't see otherwise. I don't go to science fiction for social satire. I don't go to science fiction for criticism of society. I can get that by just looking at a newspaper and muttering to myself. I go to science fiction for sweep, for vision, for beauty, for the mothership hanging overhead, for those special moments of wonder. Admittedly, it's harder and harder to find them. It's much easier to have your mind blown when you're 12 years old. But I can still find those moments occasionally. It's in that hope of discovery that I keep going back. And I still find that magic, much to my amazement and pleasure."

Next stop: *Lord Valentine's Castle*. □





The Last Day of the Old World



Above: Apollo 11 rides a pillar of flame at the start of its voyage to the Moon.
Opposite page: Astronaut Buzz Aldrin in a classic lunar photograph.

On the third Friday in July, in my study, a bottle of champagne will be uncorked. At 4:17 p.m. EDT, properly seconded by my family, I will raise my glass in the direction of my five-foot model of a Saturn V. And my cheers will quietly go out to you, Neil, Buzz and Mike, and to you, Wernher, and to all those others who made it happen. And I know I'm going to feel proud. For on July 20, 1979, it will be 10 years since Earthlings landed on another world for the first time, when the *Eagle* of Apollo 11 came screaming down to the Moon's surface.

The landing was hair-raising.

Sitting there in the Houston Mission Control Center in Texas, in the Huntsville Operations Support Center in Alabama, in the monitor rooms of the other NASA manned flight centers, our eyes were riveted to the display screens where the drama unfolded. The lunar module came around the Moon's eastside into sight of Earth, already on a descending course. At 4:05 p.m., with 12 minutes to go, the lander's rocket engine fired up. Direction and magnitude of its braking force were controlled automatically, by computer. A downward-looking radar provided altitude and velocity data.

Ten Years After Apollo 11

By JESCO VON PUTTKAMER

Suddenly Neil Armstrong's voice barked, "Program alarm! It's a 1202!"

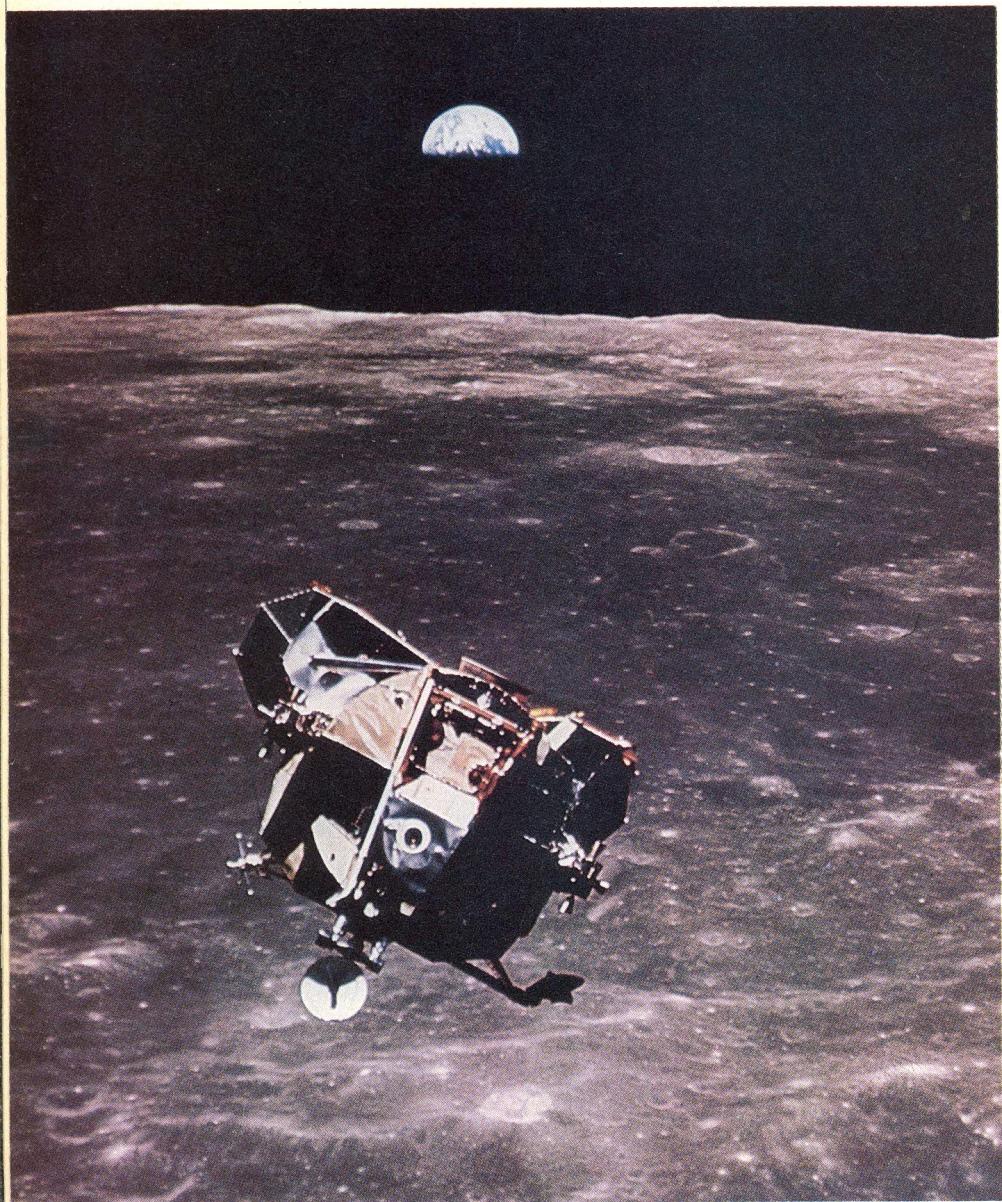
At five minutes and 16 seconds after ignition, the computer was crazily flashing yellow signals: "1202...1202..." *Alarm! Alarm!*

What a thoroughly scary moment, so starkly remembered! Because these were "executive alarms," signalling an imminent computer breakdown due to computational overload. They were interfering with an early assessment of the landing approach by the crew. But they didn't faze the flight controllers who were monitoring the descent guidance as reported by Doppler tracking from several Earth stations. In case of problems with onboard systems, those were to be used as a "voting source." And so, flight controller Stephen Bales made his judgment and gave the word to Neil Armstrong and Edwin Aldrin: *you are go!* Ignore the computer and proceed with the landing!

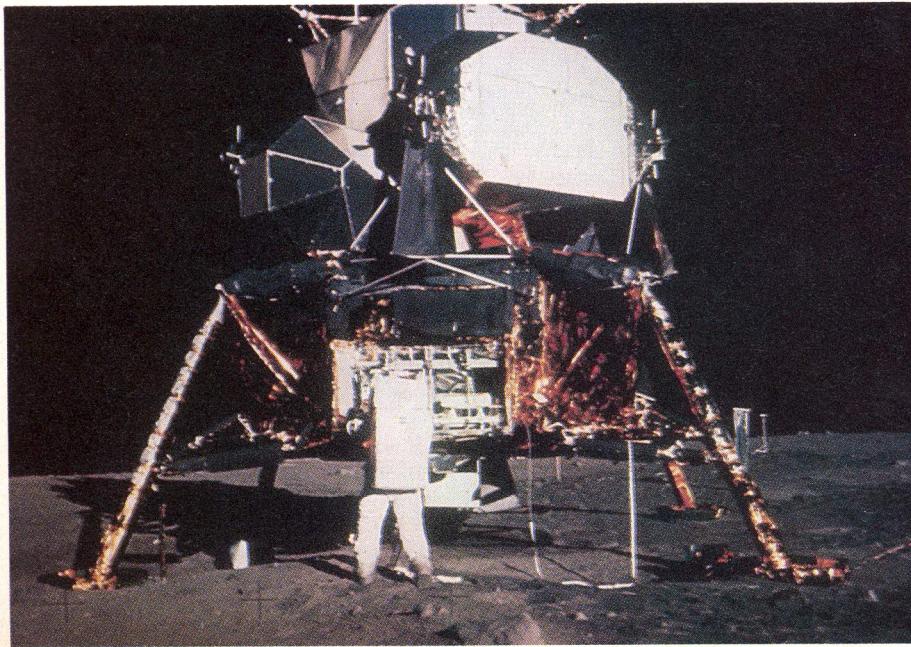
Later it turned out that the *Eagle* computer, organized to handle a number of different functions simultaneously by time-sharing, had been asked during the landing phase to handle one task too many—and it had been an unnecessary function: The processing of some essentially meaningless signals from the electronics steering the rendezvous-radar antenna on the brow of the *Eagle*, which was tracking the command ship *Columbia*.

As the computer continued flashing its alarms, now being ignored, a new menace began compounding the cliffhanger, building up—for some of us—to a state of gut-wrenching suspense.

The view out his window made it increasingly clear to Armstrong that the automatic pilot was taking them right into hazard: Its course led to a boulder field surrounding a large, sharp-rimmed crater. And so, two minutes and 18 seconds before touchdown, at a height of 600 feet, Neil keyed program P-66 into the computer, took over control and continued flight manually for about 1100 feet beyond the bad landing-area. With the Commander coolly searching for a safe place to alight, seconds were ticking by and the *Eagle* was running out of fuel fast...



Above: The lunar module ascent stage, Eagle, as it returns to the command module in lunar orbit. On the horizon: destination—Earth. Below: Buzz Aldrin, lunar module pilot, with Eagle on Moons' surface.



When the *Eagle* finally landed, a shout of relief went up. With only about 700 pounds of propellants left, no more than 23 seconds of flight time remained before only immediate mission abort and return to orbit would save the crew. And we took our first breath after dying innumerable deaths.

Sure I'm biased . . . ! But in looking back to that long, long night of July 20, I find that words will never adequately describe that tremendous surge of thoughts, feelings, emotions washing over us. The safe landing of Apollo 11 climaxed an incredible eight years of the lives of all those many people fortunate enough to have been part of it. Afterwards, those lives never were the same again. For how can you top that peak of individual professional achievement and satisfaction and pride? Something happened to our very souls.

Outside our closed environment, the world struggled to comprehend the event. Monday, July 21, was turned into "Moonday," and President Nixon declared a national "day of participation." San Francisco's Mayor Alioto urged citizens to fly the flag day and night during the Moon mission. Band leader Duke Ellington composed a special song, "Moon Maiden," and made his singing debut broadcasting it. At Chicago's O'Hare Airport, an elderly lady awaiting a flight simply stood up and sang "America the Beautiful" at the top of her voice. In Peru, a mother named her baby, born during the flight, after Neil Armstrong. Radio Warsaw said "Let them come back happily! Their defeat would be the defeat of all mankind." A Bogota newspaper headlined, "The Future Has Commenced!" while a West German paper bannered, "Boys, Come Back Safely!"

Throughout the preceding 102 hours, punctuated by these responses from all over the world, the mission was smooth and on schedule, ever since the tremendous liftoff of the mighty Saturn V on July 16. "Estupendo!" a Spanish TV announcer shouted. A Soviet professor in Moscow telephoned, "Attaboy, Americans!" and Arthur C. Clarke said on CBS television, "I haven't cried or prayed for 20 years, but I did both today. It was the perfect last day of the old world."

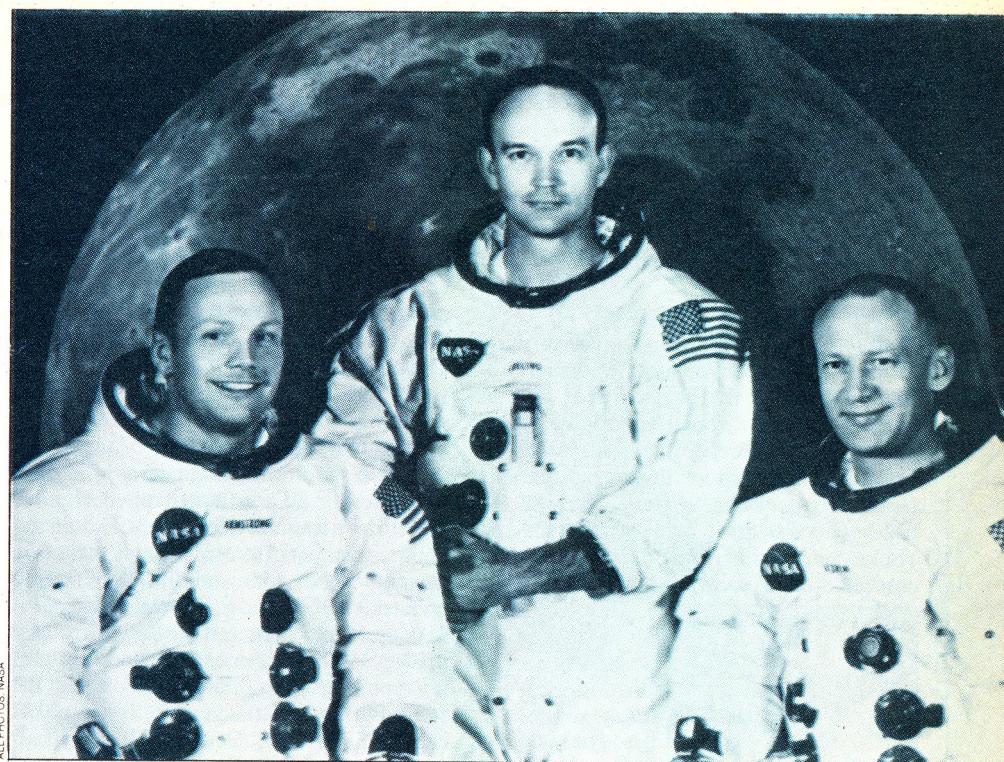
For those of us in the Apollo team who worked on the Saturn V itself, the liftoff had a special meaning. The new tools and techniques of systems engineering and program management, first introduced in the Air Force and in such undertakings as the five-and-a-half-year Manhattan Project but modified uniquely for the eight-year Apollo Program, taught us engineers how to pool our knowledge, skills and motivation in large-scale teams. Even so, very few of us were completely familiar with the entire 364-foot-tall monster machine, and no one was at ease when that mammoth took off on five roaring engines as large as two-and-a-half-ton trucks. Over all, Apollo 11 had eight million working parts, 91 rocket engines and, fully loaded, the weight of a Naval destroyer. Little wonder, then, that we built into the

Saturn all kinds of safeguards, margins and redundancies hedging against malfunctions and providing "abort modes" to the crew, just in case...

Of course, there is a better way for you to get an appreciation of Apollo's magnitude than looking at spectacular statistics. Just go out in your backyard some night, look up at the Moon, *really* look up and try to imagine how you would do it if you had been asked to do it, back in that Camelot Spring of 1961 with its oddly desperate enthusiasms.

Yes, on that morning of July 16, when launch vehicle AS-507 was fired out of Launch Complex 39A, we were in awe. We had "go fever," champing at the bit to have the bird, the big one, get off on time. Earlier that day, Dr. von Braun, in charge of Saturn development, heliocoptered over from the Holiday Inn in Cocoa Beach where he and his family stayed in Suite 192. We knew, after eight years of intense work, that we had good hardware, but as Wernher said in the firing room after liftoff, "You also know there's a lot of room for mistakes, and this is the sixth one in a row."

All together, 15 Saturn Vs were built. (Two Saturn Vs are left over today, both on public display.) For us engineers, it meant a task of often-baffling complexity that could not tolerate failure. A unique challenge of our professional skills, of human curiosity and pioneering spirit, a new frontier of creative



The Apollo 11 astronauts: Neil Armstrong (left), Buzz Aldrin (right) and Michael Collins (center,) who orbited the Moon while Armstrong and Aldrin were on the surface.

realization of idealistic thought models—the dream goal of every engineer in the world. For industry, it meant big business: billions of dollars flowing in through thousands of contracts and subcontracts with tens of thousands of U.S. industrial firms in almost all states, and huge payrolls for close to 400,000 people—as many as were engaged in manufacturing autos and trucks. By pushing our industries to the limit, Apollo spawned new ideas, new management methods, new techniques, new quality control, new developments that were breaking new ground all along the way and strengthening the nation's industrial foundations: Pratt & Whitney, RCA, Rockwell, IBM, Boeing, Honeywell, McDonnell Douglas, Bell, Grumman, and countless more. For the nation, Apollo gave birth to a new sociology involving government, industry and universities in close-knit, massed teamwork, made possible by the new tools of project management—which some of us liked to describe as "the art of doing what you said you would."

What was it that killed off Apollo after those unforgettable summer days 10 years ago?

In that very same summer of 1969, President Nixon recommended the largest cut in the NASA budget of any year since the agency's inception. The President's Space Task Force under Vice President Spiro Agnew had recommended a continuation of Apollo lunar missions, along with development of a space shuttle, a permanent space station, and a manned expedition to Mars before the year 2000. Apollo originally was conceived by John F. Kennedy, Lyndon Johnson and their advisors in response to the Soviet Union's successes with Sputnik 1 and Yuri Gagarin's orbital flight, in order to re-establish

American preeminence in science and exploration and, thus, its prestige in the world. But much had happened in the eight years since: the deaths of John Kennedy, Robert Kennedy and Martin Luther King, the black people's outcries at Birmingham, Selma, Watts and wherever there were ghettos, the violence at the 1968 Democratic Convention in Chicago, the drug subculture and the Manson murders, and the nation's growing reactions to the Vietnam involvement. Simply, the nation's mood had changed, as reflected by a Congress increasingly preoccupied with problems on Earth, and generating little enthusiasm for bold new ventures in space.

And so, right after Apollo 11, the "rules of the game" were changed on us: from a rationale of political prudence, prestige and preeminence to one of economic merit. Our activities in space now had to meet the pragmatic test of costs versus benefits. Since the lunar landing program had never been designed to these new standards, it had to fail the test. Thus, one year after the first Moon landing, because of reduced funding, NASA had to cancel Apollo 18, 19, and 20, and subsequently revise and curtail its plans for the Apollo Applications Program, later to be called Skylab.

Well, we faced the music: Our old dream of putting men on Mars receded into the limbo of a far future, out of our professional lifetimes. At first, our disappointment was immense. There were shouts of "Not fair!" Ensconced in our Shangri-La of engineering, we felt deeply hurt when the momentum slowed down. Somehow it seemed senseless that 10 years of our lives had been dedicated to what now was labeled by many a wasteful exercise of technological bravado. Then,

(continued on page 66)

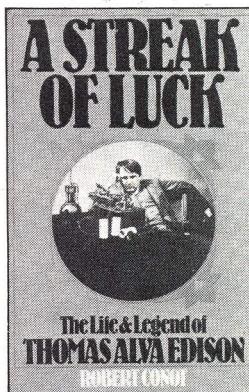


Author Jesco von Puttkamer, one of the engineers responsible for developing the Saturn V rockets. This photograph was taken in 1973, when he was working out the details of how to rescue the damaged Skylab space station.

Time Trips—Fact and Fiction

Edison Revealed

Now if the word history brings to mind dusty books, myopic professors and absolute boredom, the problem may be that you've suffered through too many freeze-dried facts to appreciate that history's full-tilt boozos are often more important than its clean-cut *great men*. In truth, many of the history books' great men were considered kooks until time and posthumous PR covered up their eccentricities.



Edison can be called the inventor of the modern world with little exaggeration. But the Edison you meet in Robert Conot's *A Streak of Luck* (\$15.95 in hardcover from Seaview Books) is nothing like the clean-living, upstanding scientist you find in most history texts. Here, Edison is portrayed as an obscene, often unwashed taskmaster, uncomfortable in crowds and always looking for a place to spit.

As Conot uncovers Edison the inventor, he finds a crackpot. Edison is a man who sleeps in his clothes because he believes that taking them off will induce insomnia; bathes so rarely that his company's European branch dispatches cables to him addressed "Dear Dung-yard"; theorizes that warts are runaway cells ("they get away from a toe and end up on the nose... go crazy and start building a toe and we call it a wart"); and, late in life, almost starves to death when he stubbornly decides that food is poisoning his intestines.

Evidently, Edison is a more complex and contradictory character than we've been led to believe. A brilliant electrician, chemist and promoter, he's also a dreadful businessman and a clumsy engineer. The combination of these attributes and an incredible streak of stubbornness enable Edison to be a millionaire at 40, yet deep in debt his entire life, never paying a bill he can put off another day.

In the 1890s, inventing is what all ambitious young men do. This seems simple to young Edison (who's lost every job he's had on account of his tinkering and

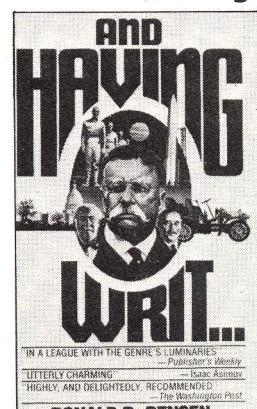
experiments)—he just makes lists of things the world needs and sets out to invent them. The difference between him and all the other young men is that Edison delivers dozens of inventions a year and makes sure everyone knows about it.

Edison's promoting is almost as important as his inventing. Even though other inventors tout their attempts at electric light, Edison announces his system so convincingly that every newspaper in the U.S. and Europe gives daily updates. The whole world watches Edison light up Menlo Park and the legend grows.

Since 1979 is the centennial of electric light, it's especially appropriate that Edison is the subject of this fascinating biographical debunking. Robert Conot is the first biographer to search the vaults of the Edison Archives and from that treasure trove of more than a million letters, notebooks, drawings and documents of every description, Edison emerges as a man whose gargantuan hunger for profit is constantly undermined by his manic curiosity.

This book revises some events and turns others topsy-turvy, but the picture that emerges is infinitely more interesting than the legendary bland old man in a lab coat. Edison's was an exciting life and this is a thrilling (and often funny) account of the roots of modern technology.

Rewriting History



Of course, even history with all the warts on can't satisfy a science fiction writer. In *And Having Writ...* (\$1.95 in paperback from Ace), Don R. Bensen takes the same period of explosive inventiveness, the early 1900s, and crashes a crew of interstellar explorers into it. Their ship splashes down just outside the San Francisco Bay during the last months of Teddy Roosevelt's administration.

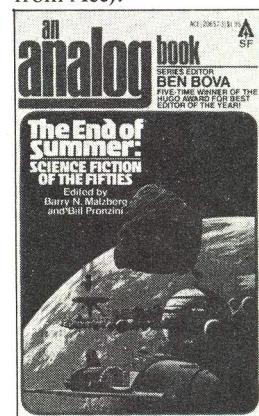
Now this crew has a non-interference directive just like the crew of *Star Trek's Enterprise*, but these guys would rather get their ship fixed first and worry about consequences later. Their plan: Earth needs World War I to get its technology on the move, so the intrepid crew sets out to convince world leaders to hurry up and get it started. Accompanied by their guides, H.G. Wells and an ar-

chetypal drunken reporter, and pursued by President Thomas Alva Edison's minions (you can see their arrival has already altered history), these four charming humanoids make a grand tour of European nobility, calling on King Edward of England, Kaiser Wilhelm of Germany and Czar Nicholas of Russia. But these aliens careen around wreaking an entirely different sort of havoc than they intend.

Best known as an editor, Bensen toys fantastically with recent history. His alien perspective on turn-of-the-century America is striking and his villainous Edison is much closer to the fellow Mr. Conot found than any of our textbook portraits.

Vintage SF

Even though most people will agree that the turn of the century was the Golden Age of American ingenuity, nobody ever agrees on the dates of the Golden Age of science fiction. Barry N. Malzberg and Bill Pronzini cast their votes with *The End of Summer: Science Fiction of the Fifties* (\$1.95 in paperback from Ace).



The 50s were boom years for short story writers. Anyone who understood the genre and could put together a sentence could make a living from the 30 monthly magazines and countless anthologies that were constantly popping up. This bustling trade in literary

futures convinced Horace Gold, editor of *Galaxy*, that there was no reason that the audience for SF should be smaller than for any other magazine, say *The Saturday Evening Post*. So he and his fellows embarked on a campaign to get SF to the masses.

Writers responded to this optimism by redefining the genre with such classic novels as *A Canticle for Leibowitz*, *More Than Human*, and *The Stars My Destination*, and a score of incredible short stories. But optimism and good writing weren't enough. The end of the decade saw magazines dying by the dozen, brilliant stories left unrecognized and writers forgotten.

This collection is notable in that it is drawn mainly from John Campbell's *Astounding*. Campbell and *Astounding* were the class act in the 40s, but started to slip in the 50s and so

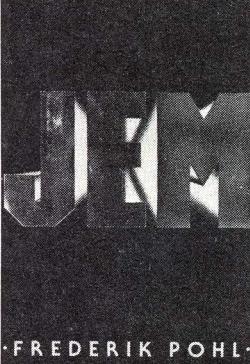
are sometimes overlooked by today's SF scholars.

The collection's brightest spots are Algis Budrys' "End of Summer," a bleak story of what we might trade for immortality and "Try and Change the Past," a gleefully morbid story of timehopping by Fritz Leiber. Isaac Asimov speculates in "Darwinian Pool Room" about the intersecting evolution of humanity, computers and the Bomb in a story that, from our vantage point 30 years up the line, rings disturbingly near the truth. In "Sam Hall," Paul Anderson paints a prescient picture of present-day terrorists' dependence on image and the media. Besides these SF celebrities, this book collects the work of such neglected stars as Richard Wilson and C.M. Kornbluth.

Although some of these stories hold little more than historical interest, Barry Malzberg's introduction and selection shed new light on SF's strange past. If you want the whole story, this is a good starting point.

Jewel

This is the way the world ends...



FREDERIK POHL

1975 with his award-winning novel *Man Plus*. He quickly followed that with *Gateway*, which won every major science fiction prize. Now Mr. Pohl offers *Jem* (\$10.00 in hardcover from St. Martin's Press), whose cover proclaims it "the way the world ends." Suffice it to say, this book is great enough in scope that the end of this world is a minor detail.

When the magazines started dying at the end of the 1950s, Fred Pohl took a long vacation from writing. During the 60s, he seemed to be concentrating on his editorial career. Evidently this didn't satisfy, because he returned to the bookstores

Jem is short for N-OA Bes-bes Geminorum 8426, a very distant planet lit by a red sun and inhabited by three strange native lifeforms. These natives include a race of singing balloon-like creatures, some very large and angry lobster folk, and fuzzy spider sorts a half-dozen feet long. It's also the scene of a reprise of all Earth's problems.

Earth's three power blocs—the Fuel Bloc, the Food Bloc and the People Bloc (alias the Greasies, the Fats and the Peeps)—each send expeditions to Jem to search for that combination of resources and advantage that will give them sole possession of this outpost. To this end, each of the three powers enlists one of the planet's native species. The Greasies set the fuzzy folk to mining, the Peeps make their lobster friends into lackeys that carry or kill for them and the Fats discover that their high-flying allies can provide a unique service—flash a light at them and they'll dispense an extremely effective (and indiscriminate) aphrodisiac.

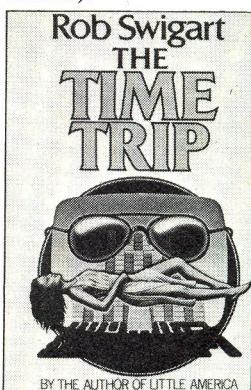
Even though this planet is humanity's first chance at peaceful coexistence away from the crowding and competition for earth's dwindling resources, everyone ignores the chance even after the outbreak of nuclear war back home renders Jem humanity's last chance for survival. In fact, the expeditionary forces on Jem seem determined to repeat all of Earth's mistakes, down to the fiery sign-off.

Pohl has written a compelling adventure, complete with real people. He gives us heroes, fools and scoundrels in equal measure, and his vision of the future is realistic, intelligent and amused. The tensions that cause the final conflict are familiar (and foolish) enough to have come from a recent newspaper and this book will either garner Mr. Pohl more gold for his trophy case or start a run on astronaut training facilities. Jem lives up to its name.

Orpheus Trip

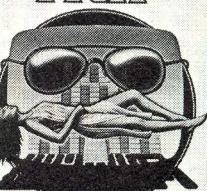
While most timehopping science fiction writers try to ground their stories solidly in some present before jumping into the distant future or the obscure past, Rob Swigart delights in raucously twisting our modern

times and then leaping into the timestream in his new book *The Time Trip* (\$4.95 in paperback, \$8.95 in hardcover from Houghton Mifflin).



Rob Swigart

**THE
TIME
TRIP**



BY THE AUTHOR OF *LITTLE AMERICA*

Barney Gamash is a computer scientist whose wife Penny has just committed high-tech suicide by sticking her head in a microwave oven and oscillating out of existence. Barney is very naturally quite distraught—he wants her back *right now*.

Swigart is aware that moving heaven and Earth to make such demands is passe, so his hero accidentally finds the toll-free phone number of Holiday Inn Deathwest and calls to ask for his wife back. When he finds out she's there but they have no intention of disturbing the universal balance for him, he angrily mounts a search for the place by tapping into the CIA's computer network.

Aided by his new friend Josh, a teenage physics whiz, and a particle accelerator obtained in his computer scam, Barney engineers a trip back to 2542 B.C. for a consultation with King Gilgamesh, who supposedly unlocked the secrets of immortality many centuries ago.

There he finds another incarnation of his wife Penny, Punumma the temple prostitute, and falls in love with her. But just as things are looking good, Barney is snatched back to the present by the dreaded "rubber-band effect."

The book's final scenes set a new record for high-speed complication, managing to lampoon est, sex therapy, the bicameral mind, computer networks, the CIA, podiatrists and even that familiar specter, Death. Despite occasional lapses into gratuitous gushiness, the book's zany parodies of California-style consciousness guarantee a good trip.

Books in Brief

False Dawn by Chelsea Quinn Yarbro (\$1.95 in paperback from Warner Books). This gripping and vividly told survival quest is set in the Dark Ages of the 21st century, a future that is the fictional apotheosis of an environmentalist's worst nightmare. Chemical and industrial pollution, localized nuclear warfare and not a few natural catastrophes have combined forces to make planet Earth nearly uninhabitable. The surviving human population fights an uphill battle against mutation, sterility, barbarism and the poison-

ous environment. In the midst of all this, one virally modified young mutant named Thea sets out to find this future world's equivalent of Shangri-La. Armed with only her homemade crossbow and her finely honed survival instincts, Thea rescues a one-armed man from the clutches of the marauding Pirates and together they travel through the treacherous Sierra Nevada—only to find that their paradise is no more. The overall feeling of this bleak novel is like one of those dreams where something horrible is pursuing you and

you find that you're running in slow motion. Suggested reading for anti-depression therapy; if you think you've got it bad... read this and rejoice.

(Robin Snelson)

The Fourth "R" by George O. Smith (\$1.75 from Dell). George O. Smith's 1959 novel, recently rereleased in paperback, concerns the adventures of one James Quincy Holden, a young man who, at the beginning of the book, has just turned five years of age. As is usual in many science fiction stories dealing with children, James is abnormally

intelligent; so intelligent, in fact, that he has all the mental facilities of an adult with none of the attendant physical advantages. This condition has been brought about with the aide of a machine which his parents invented, using James as their guinea pig.

When his parents are killed by a family "friend" who covets the machine, and who is consequently awarded custody of the boy, James must not only cope with his new enemy, but with an adult world incapable of accepting a five-year-old who is completely self-sufficient. His resourcefulness in coping with these problems, and his struggles to maintain control of his parents' invention, make for a fascinating novel.

(Barbara Krasnoff)

A City in the North by Marta Randall (\$1.75 in paperback from Warner Books). Toyon Sutak and his estranged wife, Alin Kennerin, land on the small planet of Hoep-Hanninah. He is following a childhood dream of exploring the ruins of a long deserted city and she is trying to find the secret behind the strange behavior of the Hanninah, a tribal race of ape-like beings native to the planet. Almost immediately they become involved in an escalating battle of exploitation and hidden motivations between the human colonial government and the mysterious Hanninah. Marta Randall's characters are believable in their shifting loyalties and personality growth, and they take the reader on an interesting exploration into an alien culture.

(Barbara Krasnoff)

Necronomicon by H.R. Giger (\$14.95 in paperback from Big O). European artist H.R. Giger views humanity with a visual eye that wanders from the macabre to the surreal

with marked regularity. Giger's paintings are both organic and mechanical, depicting a fairly disturbing underside of human consciousness that defies accurate description. Giger's creations are metallic, machine-like; with human faces and organs bursting through steel-like skin coverings in hellish configurations. Yet, there is beauty to be found in Giger's beasts. (This trait, by the way, led to his being asked to design the film *Alien's* namesake.) *Necronomicon*, which itself means "masks of death," is a startling collection of Giger's better known works (including his album graphics for such groups as Emerson, Lake & Palmer). Presented in an oversized (11 1/4 x 16 1/2") format, *Necronomicon* will both delight and repulse SF-fantasy art fans with its nightmarish genius.

(Ed Naha)

The UFO Guidebook by Norman J. Briazack and Simon Mennick (\$10.00 in hardcover from Citadel Press). Here's a handy reference book for anyone who has had a close encounter of the third kind either in real life or in reel. The *Guidebook*, an A to Z work, lists just about every term or phrase to be found in the study of UFOlogy ranging from abductee to zeroid (the latter, by the way, is not the slowest kid in the class but, rather, creatures who live in space). Included in the *Guidebook* are such varied denizens of UFO-land as the MIBs (those mysterious Men In Black), Ashtar (a telepathic alien presence who is a leader in the UFO zeroid community), the CIA and the Star of Bethlehem. The *UFO Guidebook* is not the type of work that one would pick-up and read cover to cover, but it's a handy sourcebook to have at your side the next time you're watching the

557th rerun of *Earth Vs. The Flying Saucers* on the 2 am movie.

(Ed Naha)

Millennial Women, edited by Virginia Kidd (Dell, \$1.95 in paperback). Big type on the cover which announces "including a new novel by Ursula K. Le Guin" is probably the main reason most readers will buy this anthology of science fiction written by women. The Le Guin novel, *Eye of the Heron*, is set on a planet called Victoria which is populated by two castes of exiled Earthlings. The Bosses, who appear to be descended from some South American criminal aristocracy, live in the planet's only city. They don't like it when the workers who live in the surrounding country and grow all the food decide to strike out for new settlements on the unexplored world. The agrarian workers, whose ancestors were sent to Victoria for preaching peace and non-violence on Earth, clash with the Bosses. The story centers around Luz Falco, the daughter of a Boss, who allies herself with the oppressed workers. Le Guin is a fine writer and meticulous world-maker and *Eye of the Heron* is up to standard; interesting if sometimes tediously concerned with social messages.

Millennial Women also contains four short stories, of which the best by far is Elizabeth A. Lynn's "Jubilee's Story," a tale of Amazon midwifery set in a primitive future. Rounding out the anthology is "Phoenix in the Ashes," a novelette by Joan D. Vinge, alone worth the price of the book. Vinge spins a sensitive and offbeat love story, set in a hauntingly believable southern California society—several generations after-the-holocaust. "Phoenix in the Ashes" marks Vinge as worth watching. (Robin Snelson)

Nebula Winners

The Science Fiction Writers of America bestowed its annual Nebula Awards for best fiction of 1978 in New York City April 21. Master of Ceremonies Norman Spinrad, fashionably attired in a dapper green velvet tuxedo, presided over the festivities. The evening's entertainment was furnished by Bob Guccione (publisher of *Penthouse*, *Penthouse Forum* and *Omni*), who delivered a subtly hilarious tribute to science fiction, recalling the days when the genre was confined to "low-grade pulps with half-clad maidens on the cover."

The Nebula for best novel of 1978 went to Vonda N. McIntyre for *Dreamsnake*, her first novel, published by Houghton Mifflin. McIntyre won her first Nebula a couple of years back for the novella "Of Mist, Grass and Sand" (first published in *Analogs*) from whence the novel *Dreamsnake* evolved. *Dreamsnake* is due for paperback release



from Dell in June.

John Varley received the Nebula Award for best novella for his "The Persistence of Vision," which first appeared in *Fantasy*

and *Science Fiction*. The novella is included in a Varley collection by the same name published last year by Dial Press/Quantum Books. Paperback release of *The Persistence of Vision* is due in August from Dell.

Nebula for best novelette went to Charles L. Grant for "A Glow of Candles, A Unicorn's Eye," which was included in an anthology entitled *Graven Images*, published by Thomas Nelson. Best short story Nebula honors went to Edward Bryant for "Stone," which appeared in *Fantasy and Science Fiction*.

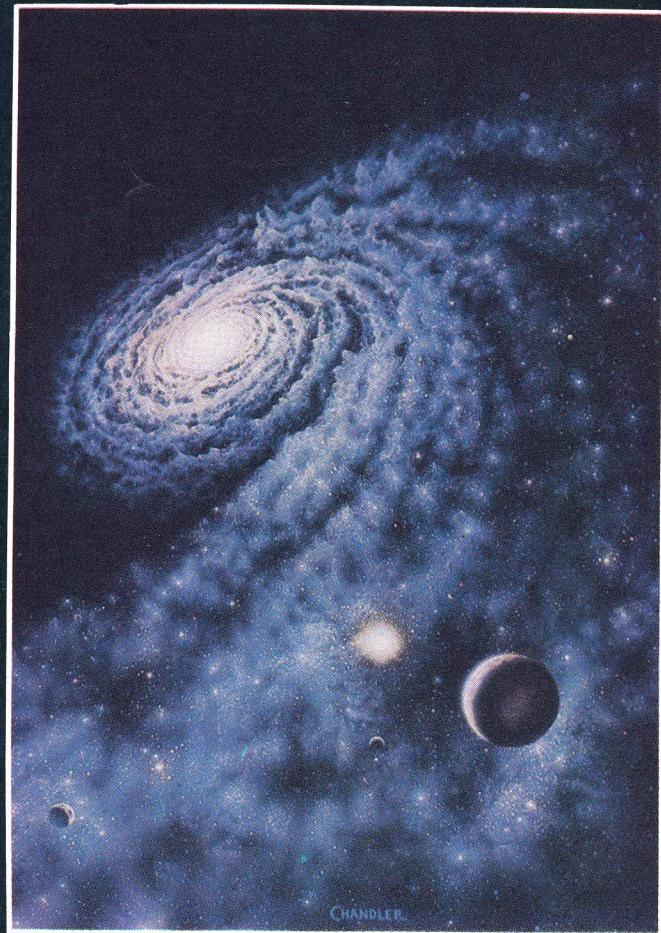
The SFWA also honored long-time SF writer L. Sprague de Camp with its Grand Master Nebula for lifetime achievement, and Superman creators Jerry Siegel and Joe Shuster received special recognition Nebulas in light of last year's celluloid success of their comic strip hero.

Geoffrey Chandler

Geoffrey Chandler's soaring spacescapes reflect his feeling that we are all very much part of the vast workings of the universe. "The elements of our bodies were once the chemicals of Earth," he says, "and the chemicals of Earth were once the insides of gigantic stars. We are made of stardust; we are the children of the stars."

The 28-year-old artist has always been interested in space and space art. His entry into the field was inspired partly by the paintings of Chesley Bonestell, he says, along with his personal feelings for the subject matter. "Mostly, it was just my fascination and awe with the universe—more of a romantic feeling for the cosmos than strictly astronomical and scientific interest."

Born in Palo Alto, California, Geoffrey received his Bachelor of Fine Arts from the California College of Arts and Crafts in 1973. He also spent a summer on scholarship at Osaka University of Arts in Japan, where, he says, "I became more aware of negative space. A brush stroke became more important because of the



space around it."

Since 1975, Geoffrey has had a series of successful one-man shows in the California area, including Stanford University's Bechtel International Center, the California Academy of Sciences and the Oakland Museum. He has also had major showings at

five Bay Area science fiction conventions. One of his published works is the classic cosmic vista (shown here), used as the cover illustration for the And/Or Press/ New Dimensions Foundation anthology, *Worlds Beyond: The Everlasting Frontier*.

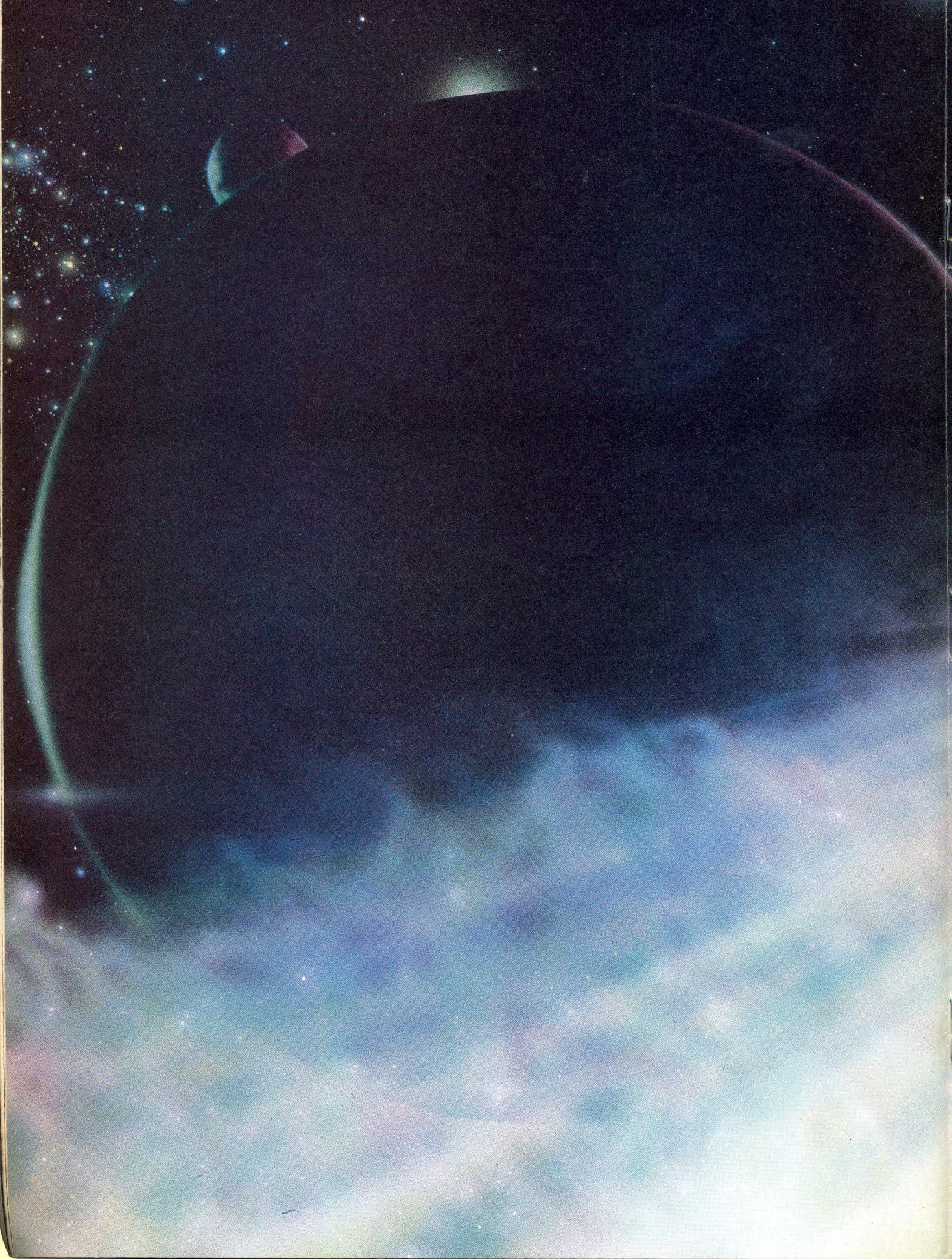
His talents are not restricted to

the visual. He has been composing electronic "classical, new age space music" for over five years, which has been used as background music for his art exhibitions, and which will shortly be released as an album.

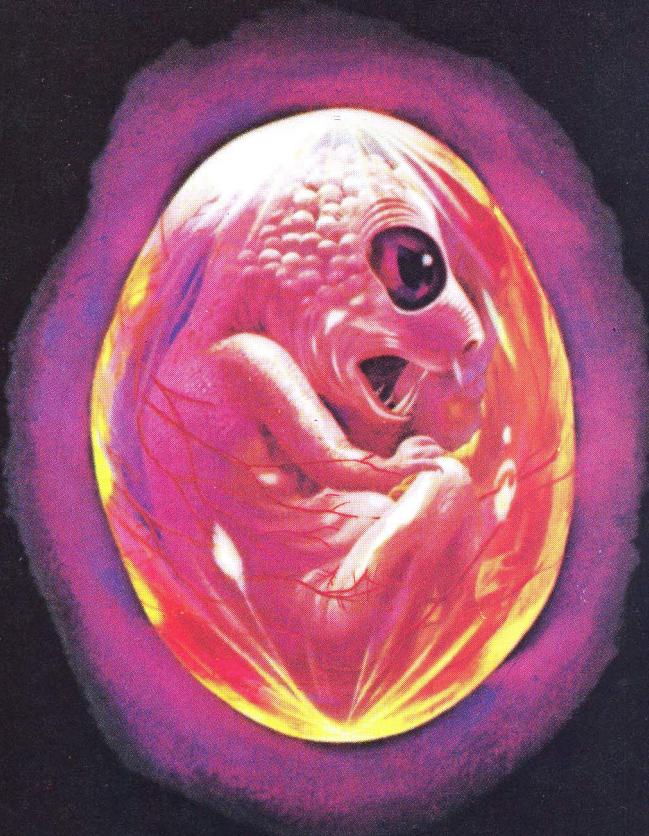
Of his painting "Iris," featured in the centerfold, Geoffrey says, "I was trying to capture the spiritual feeling of a moment in time—of light, motion, color, composition and contrast. I feel that any other description would just clutter the impact and impression of the viewer.

"The act of inspiration," he continues, "is the reality of the image itself. From a never-ending quest into the electrons of an atom to OQ172, the oldest and most remote of all known objects—ten billion light years away. The other part of the inspiration is if I can open someone's eyes, heart and mind to the beauty of the 'stellar symphonies,' then my presence is more meaningful.

"If we can try to experience and think of how we are in relation to the cosmos, I feel we can have a different and wider perspective on our own direction and purposes here on Earth."







Prophecy

A new movie looks
at tomorrow's terrors . . . today.

By JOSEPH KAY



Talia Shire, Victoria Racimo, Robert Foxworth and Armand Assante puzzle over a mutant created by toxic chemicals dumped into the water supply.

Prophecy is a suspense film that frightens on two levels. Directed by John (The Manchurian Candidate, The Birdman of Alcatraz) Frankenheimer, the movie is, first and foremost, a thriller; an account of a group of ecologists' efforts to survive against the forces of aberrated nature. David Seltzer's screenplay also, however, presents a depiction of chemically induced mutation gone wild; based, in part, on the real ecological horrors of today.

Currently, over half the land in Maine is owned by lumber companies whose paper mills along the Maine-Canada border are pumping out a poisonous substance, inorganic methyl-mercury, into its streams and rivers. For years, environmentalists have warned of the danger of these pollutants. Prophecy takes these warnings to their most horrifying conclusions.

"It's a traditional thriller," admits one of Prophecy's stars, Victoria Racimo, while visiting Paramount Pictures' New York headquarters. "But the plot is really what's happening in the newspapers every day. It's Love Canal. It's toxic waste dumping. The movie is not far removed from reality."

In Prophecy, the dark-haired Racimo plays Ramona, a militant Indian woman who has lived on a Maine reservation for years. She discovers that an increasingly large number of children are being stillborn, or being brought into the world horribly malformed. Older citizens are developing liver and brain diseases and some residents are experiencing loss of memory and attacks of dizziness. "I try to bring the problem to the attention of Washington," she explains, "but the government dismisses it all as the by-product of a stereotypical American Indian drinking binge scenario."

Robert Foxworth plays a government inspector who is routinely sent to investigate. His wife, Talia Shire, goes along. He discovers that there is methyl-mercury present in the area's water supply. We begin this long search to discover the cause of the mercury poisoning and trace its source to a paper mill that has been dumping chemical waste into nearby streams for years and getting away with it because of various political reasons. Foxworth discovers that there is a high mercury level in the blood of the local residents. That is why children are being stillborn, why people are suffering from cancer and loss of equilibrium.

"The fish in the streams have been affected by the mercury and, of course, the entire food chain has been disturbed. The fish have mutated. The animals that eat the fish have begun to mutate. The 'thriller' aspect of the movie occurs when we discover a strange creature caught in a beaver trap. It is a mutated baby bear cub. Foxworth rescues it and we all try to keep it alive. We intend to bring it to Washington as living proof of the extent of the mercury poisoning. But the mother bear has other ideas."

"Despite the fact that she has given birth to a mutant, she feels the protective urge within her and attempts to rescue her cub from the human interlopers. The bear stalks us during

the duration of the film. Complicating matters even further is the fact that Talia is pregnant. She has eaten poisoned fish. Her child is already poisoned. Should she allow it to be born or not?"

The actress pauses thoughtfully, allowing her words to take effect. Offscreen an environmentalist long connected with various ecological causes, she attempts to explain the film's ultimate aim. "Prophecy will be promoted as a suspense film," she states, "but I don't think that the thriller aspects of it will take away from the environmental aspects. I think it's a great idea to clothe serious messages in traditional entertainment because you fool people that way. You get them to enjoy the film on one level. Once they've left the theater, however, their second reaction is 'Hey, what was that movie really saying?'"

"More than anything else, this movie deals with reality. Mercury poisoning is happening here and now. Mercury poisoning is irreversible. You cannot get rid of it once it's in your bloodstream. I hope people don't regard the film as fantasy because it's not. I hope that people react to it strongly, violently, the way people did in the 1950s and 1960s to the photos of the deformed thalidomide babies in Life magazine. Thalidomide, a really dangerous sleep-inducing drug, was banned shortly after that."

Many audiences will find the film's mutations themselves a horrible sight, but Racimo feels that the graphic presentation of these creatures is necessary to give the production a jolting emotional effect. "It's not a horror movie," she says, referring to the intricate mutant makeup. "The mutations are horrifying but I think that they should be. You have to frighten people to the point of no return in order to get them to pay attention to a subject. Ideally, this movie will frighten them into realizing the dangers of mercury poisoning throughout America. But," she adds with a sigh, "I do have my doubts."

"There's an awesome amount of complacency present in America today. Look at the recent nuclear disaster in Harrisburg. Look how quickly people accepted that. I really wish that the Harrisburg incident was much more disastrous; not in terms of a meltdown or a loss of life, but in terms of being regarded as a horrendous crisis with international ramifications. I wish it had gotten to the 11:59 point instead of stopping at the 11th hour. I wish that there had been massive evacuations."

"Catastrophe brings change, but America has always been shielded from catastrophe within its own borders. It would take a catastrophe of enormous proportion, of a Harrisburg stature, to bring this country together for active, positive change. If the global community was forced to look at Harrisburg and shake with fright, perhaps the incident would have meant more in terms of improving atomic reactor safety standards, in terms of waking people up to the dangers of nuclear energy."

"Prophecy, in its own small way, is attempting to wake people up to the dangers of environmental destruction. I think that

showing these deformed creatures on the screen, depicting their struggle to remain alive and forcing people to realize that this is actually happening today is totally necessary for the film to work. Audiences have to be revolted by the concept. Then, they have to look at what's happened to Love Canal, New York and connect the two stories. Love Canal—an entire community poisoned by chemical waste. Destroyed. That's reality."

Despite its controversial subject matter, Prophecy is being touted as a "thriller" by Paramount; a conventional film in terms of structure, theme and execution. This solid Hollywood build-up is necessary, according to Racimo, for Prophecy to succeed. "It wasn't conceived as a documentary. We want to attract an audience, not drive one away. Hopefully, we'll be The China Syndrome of ecology. People often don't react to bare facts but, sometimes, a movie can really shake them up. Homogenize the subject just a little and then stick it in the theaters. Look at what The Deer Hunter and Coming Home did for the American public in terms of Vietnam consciousness. How many people have ever been in a veterans' hospital, have ever seen a urinal bag? Yet, in Coming Home, you see both in the first ten minutes. It shocked people into thinking. God, if a movie can't do that, what is film for?"

"Personally, I am repulsed by the idea that there are things being pumped into the ground that we have no control over, that can kill us within decades. These companies have been lying to us for over 20 years, dumping every conceivable waste product into the earth. How dare they? How dare they get together and vow to keep things quiet because the public won't understand what's good for them and what's not? How dare they put industry before life? How dare they keep quiet about asbestos? How dare they keep quiet about mercury? How dare they keep quiet about insecticides? We, as citizens, are considered helpless. I hope that Prophecy brings this sense of moral outrage to audiences across the country."

With such ominous messages in the back of their minds, Racimo readily admits that the actors involved found the filming an intense experience. "It wasn't a happy-go-lucky set," she smiles. "I don't have any funny anecdotes about the day the hairdresser didn't show up or anything like that. We were quite a close group and we were all aware of how important this film was. When things got a bit too heavy, we'd come up with some lame jokes, like calling the film The Bad News Bears or something. It was either that or scream."

Part shock, part sermon, Prophecy is a unique Hollywood hybrid and one that, in Racimo's opinion, deserves attention. "If audiences want fun and games," she warns, "this isn't the movie that's going to give it to them. But, I think it's an important film. It's the first film to deal with the reality of humanity's ravaging the world in a realistic and frightening way. It shows us how we can ultimately die through the use of a very innocent element called water. It's terrifying. It's devastating. It's fact."

In the arena of electronic music, Larry Fast is one of the young innovators. When he was 20 years old, he built customized electronic modules for Rick Wakeman of the rock group Yes. Wakeman encouraged the young technician to pursue both his technical and his performing impulses. In the seven years since then, he has worked with Dr. Robert Moog on designing an early prototype of the polymoog synthesizer, and has toured and recorded with Nektar and Peter Gabriel (former lead singer/songwriter of Genesis). He's also recorded three LPs on his own—Electronic Realizations for Rock Orchestra, Sequencer and Chords (Passport Records)—under the stage name of Synergy. A fourth Synergy LP is due for release this summer on the Passport label.

In a recent conversation with *FUTURE LIFE*, Larry Fast offered some of his speculations on how electronic technology will influence rock music performances of tomorrow.

In the very near future, you'll be able to do an entire rock concert with all the electronic equipment you need weighing only three pounds. You could put a little box in the middle of the stage, push a button and walk away. The technology to do that sort of thing is available now, and soon it will be available at a much lower price. It's a technical possibility, although most of the equipment is still a laboratory curiosity today.

But that's a double-edged sword. I wonder if a concert like that is really going to be worth doing. Will it be exciting enough to hold anybody's interest? Will a completely automated, high technology, thoroughly futuristic form of performance really be substantially different from listening to a record—except that it's in a huge hall?

It's not something I find particularly exciting, but I'm sure somebody is going to give it a try. But if you have a completely automated electronic performance, what's the point of having a human there? A computer can do 30 or 40 or 50 things simultaneously, while a human is only capable of doing one or two things.

In a completely automated performance, you most likely wouldn't be dealing with any of the devices that people are now familiar with as an electronic music setup. What you'd find is something much closer to a sophisticated computer setup. And the computer would be not only controlling what is going on in the sonic realm, but actually generating the sounds as well.

All sounds, all wave forms, are completely capable of being represented as mathematical formulas. The computer is a very fast, very capable number-crunching device which can deal with the mathematical formulas that represent all sounds. All the acoustical properties that we deal with in present-day synthesizers and in the real world of sound, can be represented as mathematical formulas.

LARRY FAST



PHOTO: R. A. FERDMAN

Variables can be plugged into those formulas and the computer can then carry out calculations at a very high rate of speed. Then as an output—rather than printing out numbers on paper or on a video screen—the computer's numerical work can go to a device called a digital-to-analog converter. The digital-to-analog converter is a device that translates what the computer has done in a mathematical sense back into a real world sense: numbers into sound waves.

The computer can also take in real world sounds and analyze them into their mathematical components. That's accomplished through an analog-to-digital converter, which will take real world sounds off a microphone or from a tape recording. Depending on how a computer program is written, it can then do an analysis of that sound, breaking it down into every last infinite nanosecond of detail. If you've got a properly written program, the computer can then recreate that sound. Once it's in the computer in the form of numbers, the com-

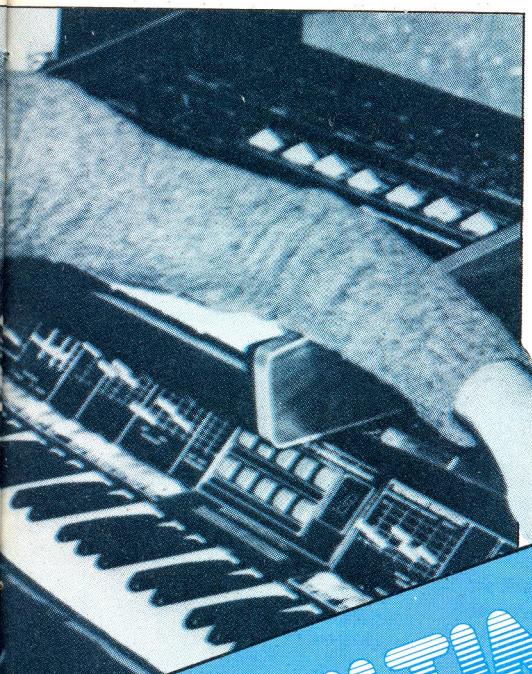
puter can spit it out exactly as it went in. What you have is essentially a very sophisticated recording.

In a completely automated performance, you'd use the computational ability of the computer for several functions: first to generate the sound; then to do whatever actions on it you want—reverberant qualities, filtering qualities and so on; to give several voices to that sound; and to organize all those voices and route them to the proper output.

So as one sort of ultimate electronic rock performance conceivable in the future, you could have a computer sitting on a stage, connected to an amplifier and a PA system. The score—the program—would have been worked out ahead of time and just pushing the run button would execute an extremely intricate program that may have taken years for somebody to write.

What you would have is a pre-programmed concert. The composer, writer or arranger sits down over the months or weeks, scoring the piece of music into the computer

Perhaps there will be performances where somebody thinks his music directly in a polyphonic sense... with a computer assist offstage...



THE ULTIMATE ELECTRONIC ROCK PERFORMANCE

memory, taking into account all the voicings and all the synthesis processes used in developing the sounds, all the timing arrangements... virtually every aspect of a big performance.

Now, that's not a whole lot different than a composer or arranger making little black notes on paper to be handed out to the members of an orchestra—except that it would be given out to several million bytes of computer memory.

The score could be entered into the computer in numerical language or through a

keyboard entry, or even written with a light pen on a screen in a manner very similar to the way a score is written on paper. It's strictly a function of the way the program is written to accept data. Once it's all in the memory, it's possible to have the computer actually perform the music.

It could be done today. There's a very sophisticated device which has been developed at Bell Laboratories that's capable of doing everything I've just described. It was built with research funds and it's frighteningly expensive, but some of the things that were developed for this machine will eventually filter out for mass use. It's proof that the sort of completely automated performance I'm talking about is possible.

But I don't know that an all-electronic performance is going to be all that exciting—unless your disk controller breaks down and the audience gets to see you sweat.

I think that what draws people to the big pop concerts is that they're able to see other people like them, except that they've become more successful or more famous or maybe they're more creative. People come to see people. In order for electronics to have a valid place in the future of music performance, that's going to have to be taken into account. What draws people to concerts is not the technology involved, but the people involved.

If electronics is going to be a part of future performances, it's going to be because someone is creative enough as a 'personality' to draw that into their performances. The most important thing, though, is to keep that live, human element. One way to do that is to keep the electronics from being real obvious. I don't mean by masking it, but rather to make

what is being done exciting enough so that the pushbutton part of the performance becomes quite secondary. It's not *how* the music was accomplished, but that it *was* accomplished. If all that happens is that a button is pushed, I have a feeling that it becomes psychologically overriding. That kind of performance fits more logically into the recorded format.

One way to get around it is to only work on stage with something that's very exciting to begin with... as in working with Peter Gabriel. The man is a show in himself.

Another point I'd like to make, without sounding too cosmic about it, is that I feel that whatever I'm doing is feeding off a sort of energy, a core idea coming from a very human place. What's happening is overwhelmingly human and the electronics simply enhance what is there.

My idea of a really futuristic concert is the ideal synthesis of the human and the electronic. I don't know exactly what that will be, but I imagine something that makes more use of the human input.

I think if there's any one breakthrough coming in the use of synthesis it will probably be in the form of a controller that is new and radical... something other than keyboard, valve or reed controls, or strings... something that's wholly new.

Mind-to-computer control is a whole new field of electronics that will, in the future, certainly be applied to music. That kind of interaction, bridging computer dumbness and human intelligence into a hybrid artificial intelligence, presents some very exciting possibilities.

The very beginnings of brain control of electronics are already happening, and it's nothing more than some of the biofeedback techniques that are being explored right now.

It's entirely possible that we'll end up seeing, at some point in the future, a whole generation of music students at Juilliard learning to think, practicing thinking properly. Maybe there will be the geniuses who can think polyphonically right away, and some people will have to develop polyphonic thought processing. A musical human brain coupled with a computer, which just serves as extra memory and extra organizational ability and sonic devices, will certainly produce some very interesting results.

Perhaps there will be performances where somebody thinks his music directly in a polyphonic sense. Then we'll have come full circle. Instead of just the computer onstage, we could end up with just the performer onstage, thinking the music, performing with an offstage computer assist. Then you're back to the human at the core.

I think that what technology develops on this planet is for humans and about humans. Technology is nothing but tools to be used by humans. As long as the humanity stays in there—especially in a live performance—people will be excited by the music and be able to relate to it.

In Search of Brave New World and Beyond . . .

Science speculation on television has always been a risky affair. Misunderstood by programming executives and TV viewers alike, the few SF shows to make it to the tube have been, for the most part, the existential pits. During the next few months, TV audiences will be treated to several truly imaginative offerings from ABC, CBS and, if the Nielson ratings permit, NBC. Here's a thumbnail sketch of what to expect in the near future.

Beyond 1984: Coinciding with the tenth anniversary of the Apollo 11 Moon landing, ABC-TV is preparing *Beyond 1984: Remembrance of Things Future* for airing sometime in July. Part of that network's "ABC News Closeup" series, the special will be written by Ray Bradbury and will be a forecast of the space program in the next 10 to 30 years. Based on current thoughts and projections of NASA scientists, academics and eminent "futurologists," the documentary will examine the likely benefits and possible hazards of humanity's continuing efforts to conquer space.

Via live action and animation, the program will review the achievements of the 1960s and 1970s, and preview the start of industrialization and colonization of space. It will detail

life in the year 2010, a proposed scenario featuring sophisticated space stations supporting entire communities of scientists and technocrats, and nearby planets being used to supplement Earth's mineral and energy needs. ABC science editor Jules Bergman and writers Isaac Asimov and Alvin Toffler will participate on the program, produced by Malcolm Clarke.

Brave New World: After nearly 12 months of indecision, NBC-TV has yet to make up its mind concerning an air date for its mini-series *Brave New World*, a recreation of Aldous Huxley's classic novel written for TV by Robert E. Thompson, produced by Jacqueline Babbitt and directed by Burt Brinckerhoff. As reported last November in *FUTURE #6*, the show was originally scheduled for the fall season, supposedly around the Thanksgiving holiday week. The show was subsequently bumped by the ratings-conscious network until the spring as part of their "made for TV novel" series, a haphazard collection of specials highlighted by the epic *From Here To Eternity* soap opera.

NBC finally gave the Huxley telecast a late March/early April 1979 air date and then, clobbered by CBS and ABC for the entire 1979 "second season," yanked the show with

only a week to go before airing. *Brave New World* is now tentatively scheduled for the fall, although with the network's erratic scheduling system, it could show up any day. NBC officially has "no comment" as to the reasoning behind the on-again, off-again existence of the Huxley show, but the series' producer, Jacqueline Babbitt, feels she knows the reasoning behind the move.

"The show is *too* good," she says with a laugh. "There are no jiggles, no car chases and no idiotic lines. Everyone connected with the show is pretty upset about this last cancellation. I was just on the phone with Keir Dullea. He found out about all of this by reading it in the newspaper!"

Victoria Racimo, who plays the head of the Beta society, wasn't overly enthralled by NBC's latest ambivalent stand, either. "I think it's absolutely stupid. But it's par for the course. I just read in a newspaper this morning that a teacher in Virginia has been suspended for assigning *Brave New World* to his 11th grade class to read. This is 1979. The book was written in 1932 and it's still on 'do not touch' lists in schools. It's unbelievable. As far as the problem with it on TV, I think everything is based upon the fact that the show is satirical and well done. It demands your attention. You have to think. You can't sit there watching it while mumbling 'Ah, in five minutes I'll go into kitchen and make a sandwich.' You have to really sit there and think. Evidently, network executives just can't fathom that."

Stay tuned for further adventures of *Brave New World* as NBC continues playing "TV or not TV."

Starstruck: CBS-TV has given the go-ahead for the half-hour pilot of a proposed science fiction comedy opus entitled *Starstruck*. Starring Beeson Carroll, Lynne Lipton, Guy Raymond, Meegan King, Tania Myren, Elvia Allman and Kevin Brando, the show details the day-to-day problems of the McAllister family, a tribe that runs an abandoned space station as an outer space eatery specializing in home-baked apple pie. The unlikely space format was written by playwright Arthur Kopit, currently represented on Broadway with *Wings* and, in the past, with *Indians* and *Oh Dad, Poor Dad, Momma's Hung You in the Closet and I'm Feeling So Sad*. Herbert B. Leonard, the man responsible for the long-running 'CBS-er *Route 66* is executive producer. Interiors will be filmed at Producers Studio in Los Angeles, while special effects, models, miniatures and space sequences will be taped at Videography in Culver City.



Above: Keir Dullea, who starred in Stanley Kubrick's *2001: A Space Odyssey* stars as the director of hatcheries in *Brave New World*. Left: Behind-the-scenes on the stalled NBC-TV Huxley opus. Right: A brand new baby is saran wrapped into the brave new world.



ELEVATOR TO ORBIT— NEXT FLOOR... SPACE!

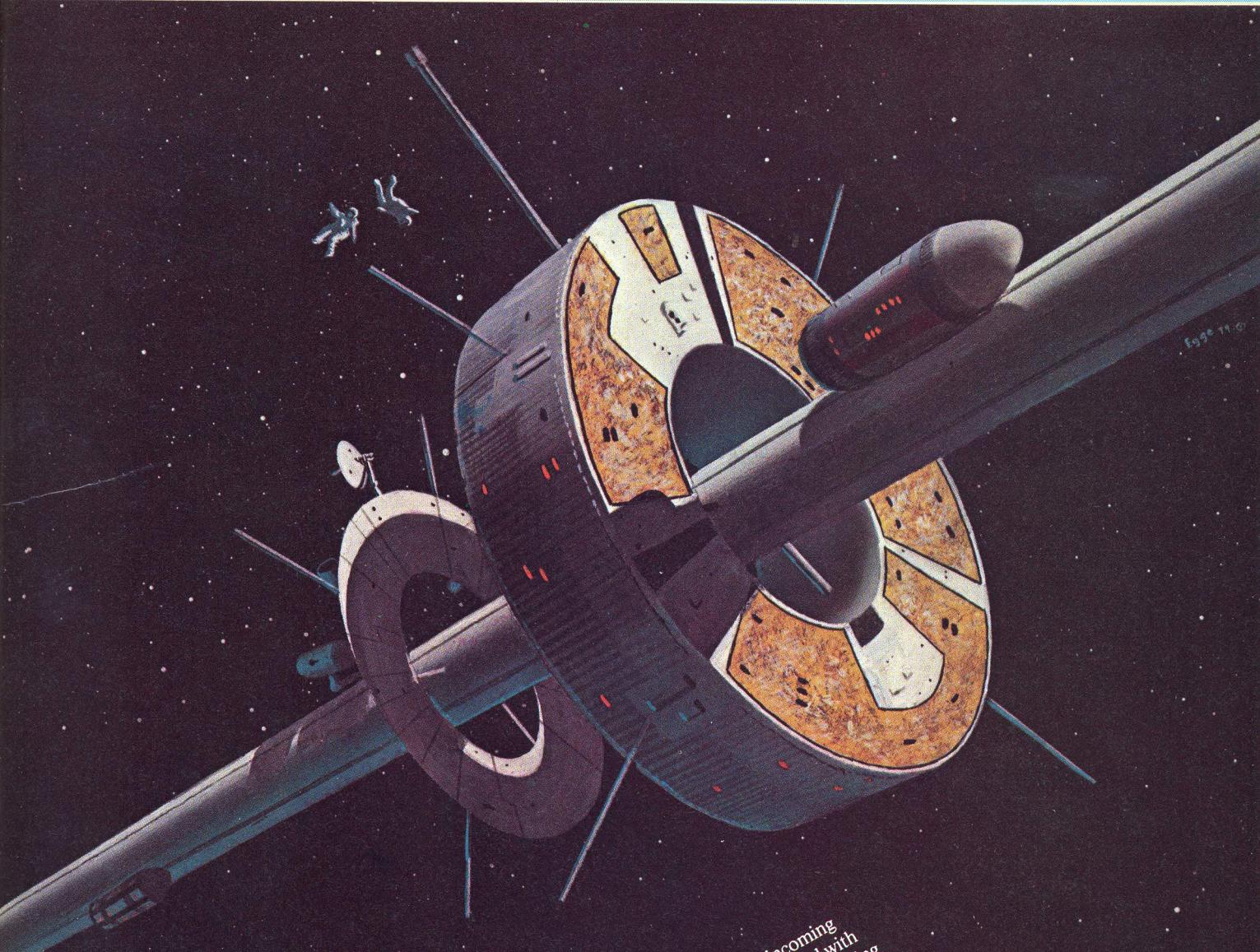
Quite clearly an idea whose time has come . . . It's a phrase which has been used before. Yet when it is uttered by the likes of Arthur C. Clarke, the master of today's science fiction and tomorrow's reality, the remark certainly deserves more than a nod of courtesy. They are being called by some sky hooks or anchored satellites. Others describe them as space catapults and orbital towers. Whatever the label, just as space colony future shock is starting to wear off, make way for an even more far-out strain of "imaginering" —the elevator to space.

Jerome Pearson is an employee of the Air Force Flight Dynamics Laboratory at Wright-Patterson Air Force Base in Ohio. Although not connected with his Air Force work, the researcher has been developing, for several years, the theoretical possibility of attaching cables from Earth to geostationary orbit.

That's 22,000 miles (35,000 km.) straight up! "I've had a hard time getting anybody to listen. Most think it's too bizarre," explains Pearson. At first glance, you could hardly blame anyone for the classification. What Pearson is advocating would radically change current methods for orbital transportation, and our future in space.

So infatuated is he with its promise, Arthur Clarke uses the elevator concept as the center of his latest novel, *The Fountains of Paradise*. Due credit is given to Pearson and other orbital tower pioneers, with the writer suggesting that the project is an achievement of the 21st, not the 22nd century. "Perhaps I

was too conservative," adds Clarke. The orbital tower involves a physical connection between the ground and an Earth orbit, making use of wires, cables, tubes, etc., and allowing transport of equipment, supplies and eventually people, into space by means other than conventional rocketry. It appears that Russian rocket pioneer

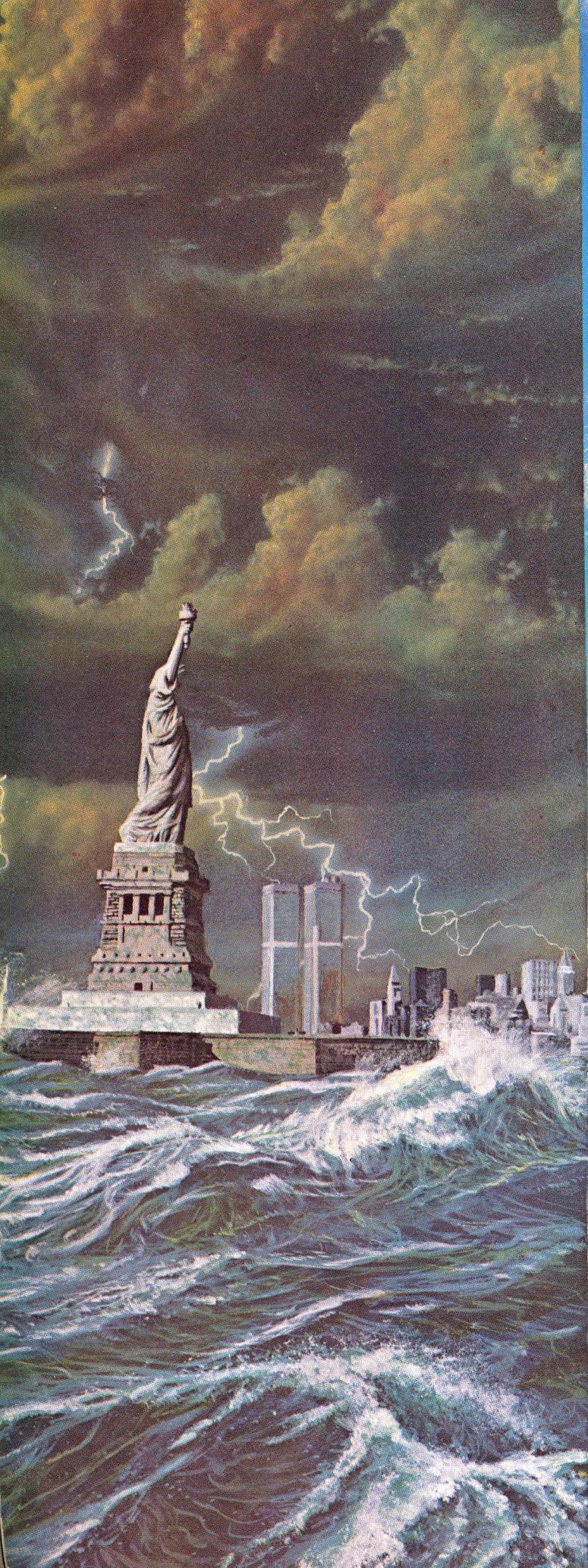


Konstantin Tsiolkovsky was first to discuss the idea in print, creating an imaginary tower in an 1895 science fiction article titled "Daydreams About the Earth and the Heavens." Tsiolkovsky, however, believed construction of a real tower into orbit would remain nothing more than a daydream. In 1960, Leningrad engineer Yuri Artsutanov solved the theoretical problems of an Earth-anchored satellite, boldly suggesting passenger-carrying capsules from which interplanetary payloads could be launched. Pearson, independent of these past works, developed a 1975 paper proposing a passenger- or cargo-carrying propulsion tower, using the electrical power produced by descending capsules to propel material up into geostationary orbit. The tower consisted of two

tubes, one each for outgoing and incoming traffic. This approach would be coupled with a solar satellite power station, beaming energy to accelerating and decelerating coils. The initial phases of constructing the tower. Pearson envisions a single thin wire, stretching from the Earth's equator out past geostationary altitude to 150,000 km. in space. Elaborate calculations indicate such a wire would itself become a satellite, delicately balanced at the stationary point. The fine wire would be tapered to the space end, providing the necessary tension. No mechanisms would be required to hold the wire down on Earth — it would float stationary, never wavering from its locale.

(continued on page 63)

By LEONARD DAVID



Future Climate: Ice Age or Heat Death?

The wind whistles down from the north, chilly even in the middle of July. The few citizens in the streets face it bravely. Before them sprawl the ruins of Chicago, silhouetted against a mountain of ice—the advancing glaciers of the *New Ice Age*.

Is this the way civilization will meet its end? Or will humanity fade away as some think the dinosaurs did, dying slowly from the heat of a runaway greenhouse effect? Or is there some way the human race can avoid both fates?

The most pressing climatic problem facing the world at large today is the threat of the greenhouse effect. The reason this possibility of calamity is most pressing is that it deals with what the world is doing to the atmosphere right *now*. Every time we burn a ton of coal or clear an acre of forest, we add carbon dioxide (CO₂) to the air. CO₂ is transparent to the Sun's rays but traps infra-red heat rays given off by the Earth. The energy gets in but can't get out; hence, the temperature rises.

But this temperature rise is only temporary. Eventually, in a thousand years or so, the CO₂ will all dissolve in the ocean or be incorporated into new plants (it stimulates plant growth quite dramatically). The rest of it goes somewhere else. The entire field of climate prediction is plagued by major knowledge gaps and one of the most frustrating is the fact that between one-third and one-half of all the carbon dioxide we know we have put into the atmosphere remains unaccounted for. And this uncertainty goes to the very heart of our CO₂ problem.

The amount of CO₂ in the air depends not on how much we have put in, but how fast we put it in and how fast it gets taken out. We know how fast it's getting taken out. But if we don't know where some of it is going, it is impossible to accurately predict when the amount of CO₂ in the atmosphere will reach a dangerous level.

However, if the rate of increase stays the same we can make some calculations. There is presently about 10 percent more carbon dioxide in the air than there was before the In-

In the future,
Earth may have to
choose between
facing slow-moving icebergs
or an asphyxiating
atmosphere.

By W. A. THOMASSON

dustrial Revolution. Not all that much of a change. But our use of fossil fuels is constantly accelerating. So much so that even if we immediately began switching to other fuels, CO₂ levels would still rise 50 percent before we finished. In fact, they'll probably have doubled by the middle of the next century. By the year 2200, if we are still using fossil fuels, they could well double or triple again.

What does this mean for our climate and for human beings? By 2050 the average temperature will have risen two to three degrees C. This doesn't sound like much, but it's been more than *two million* years since the climate has gotten any warmer. Furthermore, the warming trend will be quite uneven; hardly noticeable in the tropics but increasing as much as 10 degrees C at the poles. The consequences could be profound but not necessarily disastrous.

In fact, for the world at large, the consequences of this increase might prove beneficial! The long Arctic days would produce bumper crops in areas of Canada and the

USSR where it's now too cold to grow anything. Much of China could grow two crops instead of one. But some countries would be losers in this scenario, the United States being one of them. The first problem is that, even today, much of the Corn Belt is already hotter than "corn country" should ideally be. With a warmer climate, growing corn could become a total impossibility. Of course, if pressed by climatic change, these states could always grow other types of crop.

The other problem facing the U.S. is that all climatic zones will be shifted northward . . . and this includes deserts. While this shift will be great for Mexico, with Sonora and Chihuahua becoming fertile for the first time in centuries, it will be less than ideal for such states as Texas and Colorado.

A possibly more serious danger of this warming effect will be the melting down of the West Antarctic ice sheet. We now realize that much of what we call West Antarctica is not land, but frozen ocean. This mass may well melt. If it does, the sea level will rise five meters. Dr. Stephen Schneider of the National Center for Atmospheric Research has calculated that this melting will flood nearly half the state of Florida, parts of New York City and Boston, and most major cities along the Gulf and South Atlantic seaboard. The water will rise so much that one will be able to launch a boat from the steps of the capitol. The economic loss, according to Dr. Schneider, will be some \$110 billion.

Dr. Schneider's cost estimate is valid only for a rise occurring over a few years. There is, at present, considerable debate in scientific circles over how fast such a melt down might actually occur. Some scientists, such as Dr. John Mercer of the Institute of Polar Studies at Ohio State University, believe that it may occur "almost instantaneously" on a geographic time scale. But to a geologist, "almost instantaneously" means anything under 300 years. Dr. Mercer actually believes it will take a century or two. This is how long it took the Hudson Bay's ice sheet to melt some 8,000 years ago. Obviously, no one is

A possible serious danger of this warming effect will be the melting down of the West Antarctic ice sheet . . . if it does, the sea level will rise five meters . . . flooding nearly half the state of Florida, parts of New York City . . . you could launch a boat from the Capitol steps.

going to construct new skyscrapers on land that is due to be under water within a few decades. Hence, the structures actually submerged by the slowly advancing sea will be those already near the end of their economic lives, and little will be lost, economically or otherwise, but the land itself.

An even more awesome possibility in regards to an increase in temperature would be the creation of a runaway greenhouse effect. Huge amounts of CO₂ are normally stored in the oceans, but the warmer the oceans are, the less CO₂ they can store. So, if atmospheric CO₂ warms the oceans, they will release even more CO₂ into the air, which will then make everything even warmer. Some think that the ultimate end of such a process could result in Earth becoming another Venus—a planet characterized by searing heat and a torrid, murky atmosphere not conducive to human life. At the very least, this scenario could lead to the sort of heat death Professor Dewey McLean of Virginia Polytechnic Institute believes caused the extinction of the dinosaurs. (He points out that high temperatures will cause sterility long before they cause death.)

Fortunately, most oceanographers are convinced that this greenhouse effect could not happen now. We are saved by the fact that present-day oceans have a relatively thin layer of warm water sitting on top of a much larger body of cold, dense water. Since there is very little mixing between the two (and would be even less if the Earth was warmer), the major part of the ocean would warm much too slowly for such a climatic catastrophe to occur within the next 1,000 years.

So the Earth's CO₂-induced warming will be little more than what Dr. James Hays of Columbia University's Lamont-Doherty Geological Observatory calls a "blip" on the natural climatic trend—and that trend seems to be leading to another Ice Age. As he says, "Interglacial eras don't usually last more than 10,000 years, and we've been in this one for about 10,000 years."

If the Earth is destined to sink, in Dr. John Mercer's words, "gradually into the next Ice Age," how fast can we expect it to happen? Well, the temperature drop may be quite rapid. There are certainly precedents: 12,000 years ago, the temperature dropped two to three degrees in less than a century, and the "Little Ice Age" began, between 1350 and 1430 A.D., with a temperature drop of over a degree. (This 500-year cold spell destroyed the Viking colonies in Greenland and Newfoundland, and reduced Iceland from a major center of world civilization to a nation of peasants, barely clinging to survival and memories of past glory.)

The consequences of ice-age cooling will be the reverse of those for CO₂-induced warming. Agricultural productivity in Canada and the USSR will drop sharply. As the monsoons shift southward, India and the Sahel will suffer even more frequent drought. U.S. farmers, however, will benefit both by generally cooler weather and by increased rainfall in the arid southwest.

But then, over thousands of years, the glaciers will begin to creep south. They will cover Canada, then push on into the U.S., past Chicago and possibly as far south as St. Louis. Yet the coasts will be relatively spared. The eastern U.S. may be ice-free as far north as Philadelphia, and on the Pacific coast, as far north as Puget Sound.

Much of Europe, caught between glaciers in the north and the ice-covered Alps and Carpathians in the south, will be tundra ("cold desert") similar to northern Alaska. But climate in the ice-free parts of the United States may be reasonably pleasant. To be sure, the summers will be quite cool (a boon for places such as New Mexico) and wet (great for crops) and the winters won't be very much colder than they are now. An Ice Age winter in Santa Fe may be more like the moderate ones in present-day St. Louis than the squallid ones in today's Chicago.

Despite the possible benefits, the world at large would not really relish another Ice Age. Is there anything the world can do to prevent one? We could put gigantic mirrors into space to give us more sunshine, but the cost looks prohibitive. We could keep the right amount of CO₂ in the air using carbonate rock as a source of fuel after our fossil fuel is gone, but that's still pretty expensive . . . and we don't even know what the "right" amount of CO₂ is as yet.

An apparently more promising idea is to look for some "trigger point" through which the world's climate can be changed at little cost. Along these lines, the Soviet Union has considered building a dam across the Bering Strait, then pumping warm Pacific water into the Arctic. Their hope is to melt the Arctic ice pack, thus improving the climate of their Arctic coast. It would also enable the open ocean to absorb sunlight now being reflected off the ice pack, thus possibly warming the whole Earth. Unfortunately, we not only don't know whether this idea would work, we don't know the consequences it might bring if it did succeed. One plausible theory suggests that an ice-free Arctic would supply additional moisture (snow) to the continents, and actually *speed* glacier growth.

So it is lack of knowledge as much as lack of money that keeps us from trying to stabilize Earth's climate. If the Ice Age is

starting now—if the temperature drop over the past 30 years signals its beginning and our CO₂ output does not temporarily overwhelm this trend—we are much better off adapting to the colder weather. We may find this surprisingly easy. We all complain about winter, but those in colder climates don't complain that strongly any more. They adapt.

Dr. Fred Smith, Professor of Resources and Ecology at the Harvard Graduate School of Design, states: "We used to regard climate as constant and people adapted to climate. Somehow, in the last few years, we have come to the recognition that climate is variable, and we've applied it to a constant society. Societies change rapidly and, in particular, they change rapidly in relation to climate."

So, given a few decades, humanity could easily make the appropriate changes in lifestyle for a colder climate: Insulate our homes, buy heavier clothes and more snow-plows. In short, people in St. Louis could learn to live like Chicagoans, Chicagoans like Winnipeggers and Winnipeggers like people in Fairbanks.

However, we'd still have to feed an ever-expanding population and the colder weather would certainly be no help in this area. One obvious answer to a possible famine problem would be to shift as much agriculture as possible to the tropics. Another solution would employ the use of greenhouses. With modern technology, greenhouses aren't all that expensive, especially since their productivity rate is at least seven times that of open air farmland. Most of our present winter tomatoes are grown "under glass." So, if you add greenhouses in northern areas to new grain belts in China, Mexico and North America, the food supply will probably be ample for survival.

Of course, life could be less than wondrous if humanity is forced to live under a mile-thick glacier. Fortunately, this is one problem that we already have a handle on and it will probably be no problem at all by the time we are faced with it. A glacier grows because more snow falls in winter than melts in summer. Technology can alter both. For example, simple weather modification techniques will allow us to steer snowstorms away from the glacier front; alternatively, we could cover it each summer with coal dust so that it will absorb more sunlight and melt faster. This will cost money, but it's clearly worth it.

Thus, as it turns out, the arrival of another Ice Age need not be the scenario for a real-life disaster movie. With a little bit of ingenuity and a little more money we can survive quite nicely. This shouldn't really surprise us. After all, humans have already survived one Ice Age, and we weren't even civilized then! ■

Buck\$ In Orbit

If you want to become *really* rich, get a job in space. Any job. Learn to fit pipes, solder wires, tinker with computers, push a broom, type—you name it, there will be a job doing it in the space factories that will be built in the 80s and 90s.

Of course, there will be a lot of competition for the first jobs in space. But there may be a way to stack the deck in your favor. The prospectus for the recently formed International Satellite Industries, Inc. promises that "the Company may give preference in its hiring of space workers to holders of its common stock." I asked ISI's president, Chris Basler, if doing "good deeds" for his enterprise would also count. "I have a long memory," he replied. If you'd like to check out ISI for yourself, write Chris at ISI, 250 W. 94th St., New York, NY 10025.

Okay, let's suppose you land that dream job in space. You'll soon discover that your paycheck doesn't exactly put you in a class with the Rockefellers. However, there is one fringe benefit of your job that can make you filthy rich. That benefit is the fact that you are located in space.

A typical space worker's apartment will probably be a section of a used shuttle main tank, equipped with a bookcase, TV set and waterbed. Rotation will provide Earth-normal gravity.

You can make a lot of money off that modest apartment of yours. First, you divide it in half. You live in one half. In the other half, you install submarine-style bunks, and put up a sign reading "Galactic Empire Flophouse."

Jaded jet setters, *nouveau riche* commodities dealers, robed sheiks and winners of the Irish sweepstakes will shell out huge sums for a chance to bunk in your joint. And in the hours after work that your less ambitious coworkers spend watching TV, you can give guided tours of the factory, employee's gymnasium and cafeteria. For a fee, of course.

You still have unused space in the other half of your apartment. So you buy some grow lights and hydroponic equipment, and plant greenies. Your tourists are so grossed out by the company cafeteria fare that they'll pay good money for cucumbers, tomatoes and lettuce fresh from the garden. So will other space factory co-workers. If you really pack in the plants you could get five pounds



HANK CARUSO 1979

of vegetables per day from your bedroom farm.

After a while you make enough money off your by now terribly cramped apartment to buy and outfit your own surplus shuttle main tank. You fill one quarter of it with Galactic Empire Flophouse, another quarter with your Pie in the Sky Eatatorium and the third with gardens and livestock to supply salad and rabbitburgers for your Eatatorium. You build office space in the fourth quarter and rent it to other factory workers.

One office is rented by the guy who has started the local newspaper, *The Colonist*. Because paper is too expensive in orbit he's been putting it out on microfiche. It's a good thing you had that office for rent, too, because the company got hacked off about *The Colonist's* editorials knocking the cafeteria food and booted its editor off company property. Now space factory workers flock to your renovated shuttle tank to read the latest dope on what goshawful stuff went into the glop the company served last Thursday. They buy tacos and rabbitburgers at your Eatatorium before going back to work.

One of the most popular factory workers rents the office next to *The Colonist* and puts out her shingle: Betty's Massage Parlor.

Someone else opens a laundry. A real smart character starts buying garbage off the notorious company cafeteria—a lot of stuff gets left on the plates. Andromeda Recycling smells a bit weird at times, but its proprietor makes a lot of money selling soap, chicken feed and fertilizer. And you're making lots of bucks off those office rentals.

Meanwhile, Joe the Tinkerer has outfitted another discarded shuttle main tank for zero-g work. He uses half for his laboratory and rents the other half to Betty. She puts up a giant neon sign: Zero Gee Whiz Fun House. A famous producer is seen having rabbitburgers with Betty in the Eatatorium, a contract is signed and soon the place is crawling with actors and actresses and people toting movie cameras and lights.

However, Joe gets embarrassed easily, so when Betty's lease runs out he serves an eviction notice. But that's okay because Betty, using her profits, has nearly finished building her giant pleasuredome.

"Calculator" Leibowitz moves into one of Joe's zero-g offices. One day he bursts into the Eatatorium screaming "Eureka!" He's carrying a glop of purple stuff. It's the long-predicted but never before synthesized organic room temperature superconductor. Within days people with briefcases and expensive suits are crowding your Galactic Empire Flophouse and Leibowitz's patent lawyer is looking frayed at the edges. By the next full Moon, construction is underway on Leibowitz's factory.

The influx of new workers brings along more would-be entrepreneurs. Soon there are four restaurants and three hotels and five farms and a boutique and a barbershop.

One day you realize that you're rich and bored! So you sell off the Eatatorium and the farm and Galactic Empire Flophouse and buy a heap of deep space gear. You spread your solar sail and soar off to the asteroid belt to found a new city and an even greater fortune.

And next time you get bored, you just might set sail for Epsilon Eridani.

Carolyn Henson is a founder and President of the L-5 Society, a non-profit organization dedicated to making space colonies a reality in our lifetime.

Earthport

The science fiction dream of an international spaceport moves closer to reality.

By DR. LARRY SMARR

(Harvard-Smithsonian Center for Astrophysics)

It is dusk as your Boeing 767 banks over the west coast of Africa. Peering through the window at your side, you catch your first glimpse of Earthport Libra. Seen from such a lofty altitude, the settlement appears to be a series of vast circles, triangles and rectangles; all pushing their way through the lush jungleland. As the plane nears the landing field, more details become evident below.

Large factories, minus the traditional clouds of haze and smog yet evidently in full use, dot the landscape. A network of canals runs inland from the busy harbor, graced with various clusters of floating homes and businesses. Electric minicars and buses speed along uncrowded streets. Dwarfing all of these structures, however, are the vast geometric patterns of the landing areas set aside for planes, space shuttles and various spacecraft.

As the passengers begin to file off the plane, it becomes evident that Earthport concentrates on efficiency on all levels. There is no trace of the long lines and red tape normal-

ly found at a busy urban airport. All transactions are computerized with the aid of pocket electronic data cards carried by travelers. After a three-minute encounter with customs, you make your way to Libra's city center via the ultra-fast Mag-Lev (magnetic levitation) train. Since you have an hour before your Earth/Moon shuttle lifts off, you decide to take a close-up look at this truly international city.

As the Mag-Lev speeds through the city, you take note of the factories and office buildings which line both sides of the main thoroughfare. None are more than a few stories tall. Most of Earthport, it seems, is contained in well-designed, climate-controlled underground facilities. Long swaths of greenery, pedestrian parks, surround the buildings, giving both workers and visitors alike a chance to unwind in a setting dominated by tropical flowers.

The train reaches the end of the line and prepares for its swing back to the landing areas. Taking a slightly different route back, the Mag-Lev passes through a residential neighborhood where you take note of the small groups of children playing before the

rows of terraced homes.

On the return trip, the Mag-Lev fills with passengers, all on their way to various off-Earth destinations. Some will head for locations in orbit. Some will journey to the Moon or beyond. The rumble of a large freighter taking off shakes the train ever so slightly. You gaze out the tinted window. Moving almost too fast for your eye to glimpse, a payload darts toward the Moon on a long, slim laser pathway. You settle back into your seat and reflect on what you have just witnessed: Earthport Libra's primary function—the dispatch of craft, supplies and personnel into space.

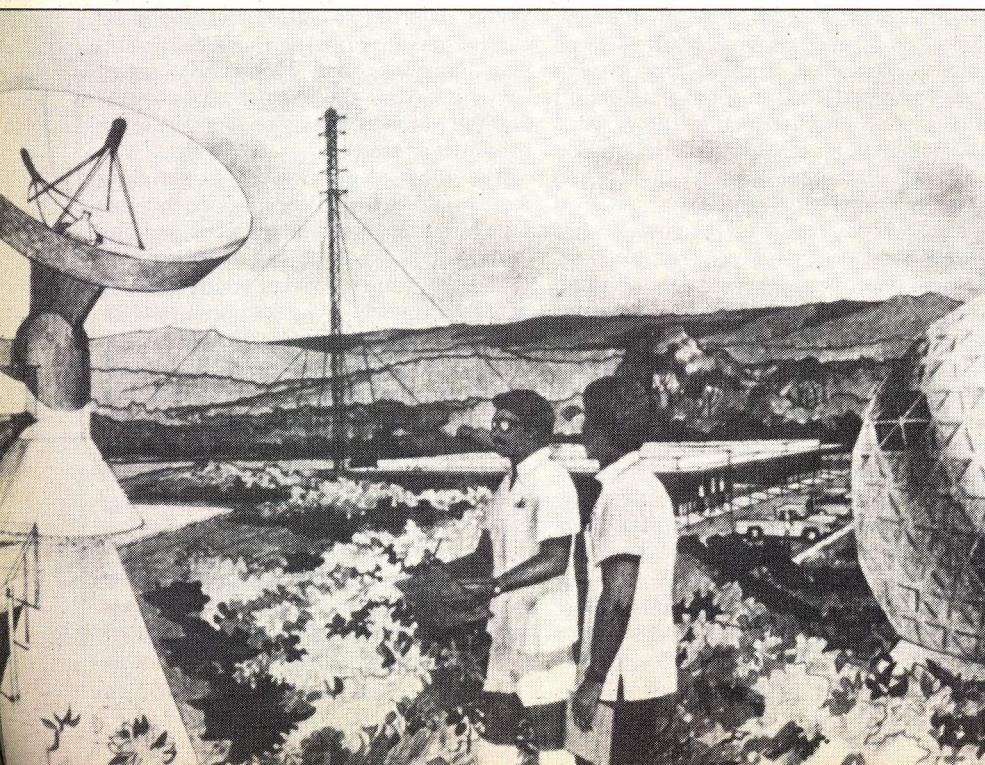
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Although the setting described may now be fantasy, odds in favor of its eventual existence are growing every day. Developing nations are now beginning to position themselves for a share of the space development benefits, through support for the Earthport Project (familiar to readers of FUTURE #5). The goal of this remarkable effort: to create a new launch zone near the equator as a means of lowering cost barriers for users of space from all nations. Its progress bodes well for those who want space to be a free and open frontier.

Forerunners to the Earthport Project can be found in the works of today's premier science fiction writers. In a 1951 book called *Islands in the Sky*, Arthur C. Clarke pointed out the value of an international spaceport near the equator, from which rockets can be lofted into orbit most cheaply. Several years later, Robert Heinlein coined the word "Earthport" to describe the international space launch site in *Starman Jones*. Taking advantage of equatorial economics, the French space agency is now setting up rocket facilities in French Guiana.

Earthport began three years ago as a research venture of a foundation determined to bring down the cost barriers to space. With Clarke, Heinlein, and former astronaut Philip K. Chapman among its first supporters, the Earthport Project has since grown to include such pioneers as Buckminster Fuller and Krafft Ehricke, and more than 100 specialists around the world in fields ranging from astronautics to international business. "We see the equatorial nations holding a key to increasing access to space," says Mark Frazier, director of the project for the Sabre Foundation. "By setting up a

World Space Center, the first stage of Earthport, will provide transfer of useful space technology—such as Earth resources usage—to Third World nations.



ART. JAMES MCNAMEE © EARTHPORT PROJECT

A heavy-lift launch vehicle blasts off from Earthport, on its way to a Moon mining operation or one of Earth's orbiting space colonies. Because of its location on the equator, Earthport's spacecraft will have the best possible liftoff momentum and efficiency.

spaceport for the planet, all nations could enjoy the advantages of equatorial launch without the need to build duplicative sites."

Yet the Earthport concept involves a good deal more. It is grounded in a firm belief that commercial space opportunities will be the driving force behind development of the frontier. To avoid an unproductive clash over the use of space resources, the project has come up with a way that might give all countries—particularly the developing nations—a share in the space industry profits. In recent months, Earthport organizers have scored some major successes in their efforts to turn a "science fiction" vision into reality.

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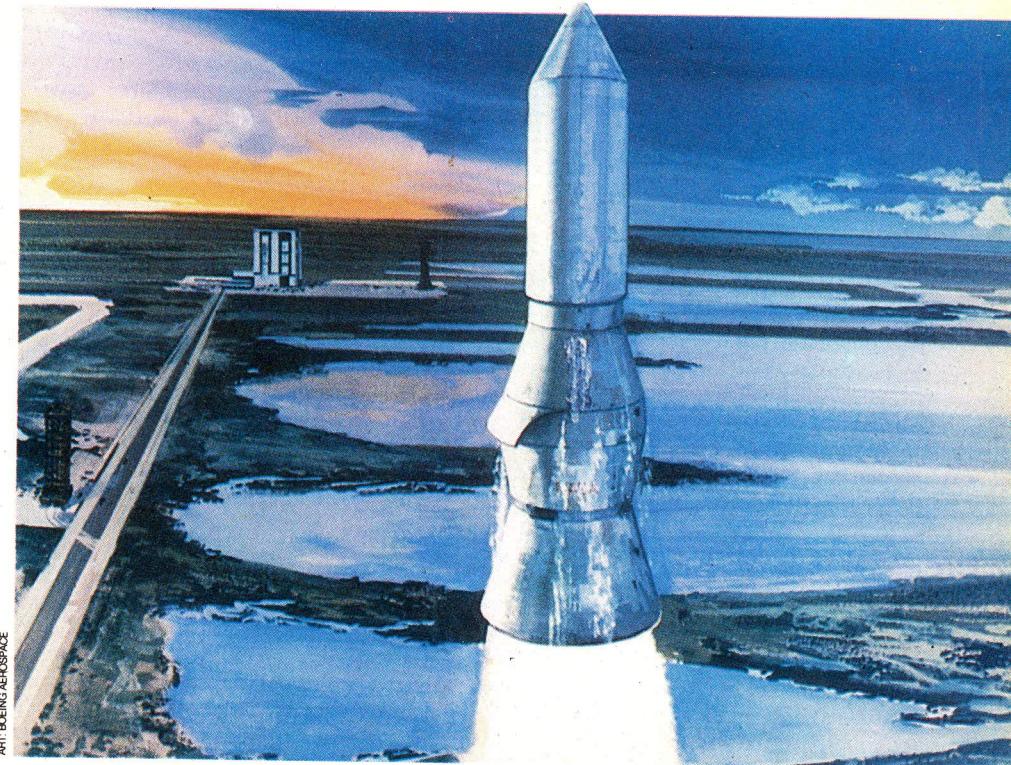
The Earthport Project grew out of a two-day meeting in October, 1976, in which a group of students, businessmen, engineers, and scientists discussed some of the benefits that space might hold. From the potential riches of asteroid mining to the prospect of huge satellites beaming energy to Earth, participants agreed that the promise of the frontier could be crucial for humanity.

A shadow nonetheless fell across the prospective benefits in the eyes of most of the participants. Who, or what, would control access to space? If left to the great powers, they felt, space would remain in the hands of governments unlikely to welcome a planetary distribution of benefits. Worse, space might become an arena for military rivalries among the superpowers, dominated by orbiting beam weapons, laser emplacements and killer satellites. Space would fall short of being a frontier for all mankind.

Out of the meeting came a decision to work for development of an international launch site as a world gateway to space. The launch zone would be neutral, and operated as a freeport similar to Singapore and Hong Kong to build up a dynamic economy. Any peaceful launch organization would be welcome to make use of the zone.

Because the Earthport idea amounted to a challenge to the virtual American and Soviet monopoly on space, neither country immediately embraced the proposal. Yet a network of volunteer researchers soon formed in support of the Earthport Project during 1977, reaching into such institutions as NASA, Stanford, Berkeley, Harvard and the National Planning Association.

One group of Sabre Foundation research-



ART: BOEING AEROSPACE

ers, the World Space Project, began exploring in depth some of the benefits of an international, equatorial space launch site. "We quickly found some highly promising advantages," notes Jim Bennett, coordinator of the space study group. Among them were:

- **More boost for launch vehicles.** At the equator, the spin of the Earth amounts to almost 1000 miles an hour in an easterly direction. Rockets launched to the east from the equator are therefore more efficient than those fired from other latitudes, where they have less momentum from the Earth's rotation.

- **Simpler orbital paths.** To enter an equatorial orbit, most satellites now launched must make wasteful "dogleg" maneuvers. An equatorial launch site can render these curving paths unnecessary, and simplify tracking procedures as well.

- **More frequent "windows."** Because satellites launched to the east from the equator pass overhead on each orbit, opportunities arise regularly for spacecraft to rendezvous. If a space vehicle in equatorial orbit is to return to Earth, landing procedures are simplified by the position of the recovery site in the orbital plane.

- **Shared ground support services.** Costs for launch organizations can be held down through joint use of launching gantries, tracking equipment, and telecommunications hardware. "Airlines don't go to the trouble of each building an exclusive airport," explains Bennett. "There's no reason why commercial launch providers should have to either."

Members of the space study group found yet another reason for favoring an equatorial launch site. In the event of a decision to build

solar power satellites, construction crews might be exposed to dangerous levels of radiation as they passed through a region known as the South Atlantic Anomaly, while spiralling out to geosynchronous orbit. If launched from the equator, the solar power satellite construction crews could bypass this area completely.

A second research team of the foundation, known as the World Free Zones Project, was simultaneously engaged in studying the economics of the Earthport concept. Members of this study effort felt a need to ensure that Earthport would thrive as a center of trade and commerce. To accomplish this end, they reviewed the experience of a number of free trade zones around the world.

"Only by offering special incentives for all investors could we find a way to ensure that Earthport would build an economic base," says Professor Alvin Rabushka, a Stanford-based specialist in free zones. "After looking at a lot of existing free zones, we decided to do Proposition 13 one better, and abolish taxes and tariffs entirely." The resulting investment boom, reasoned members of the study group, would speed the development of all kinds of industries at the spaceport site.

The policy of exempting everything would directly benefit world space initiatives. Earthport could generate a large annual income simply by renting its tax- and tariff-free land. Part of this lease income would go directly to the host nation, but a large part would be dedicated to new international space efforts. Although the exact amount of revenues would depend on factors ranging from Earthport location to labor availability, the performance of existing free zones in developing countries suggests that more than \$3 million

"We see Earthport as a way to internationalize access to space, by lowering cost barriers and helping a 'live and let live' attitude prevail.

Trends are pointing to an inevitable need for a spaceport to serve the planet. Like other ideas of science fiction, it's bound to happen."

per square mile would be paid yearly in rent by factory owners. An Earthport measuring about 20 miles square might generate from \$500 million to \$1 billion a year, once most of its land had been leased. Such figures were to play an important role later when project participants began exploring uses for the money.

By late 1977, the findings of Earthport researchers were ready for an initial presentation to the developing countries. Officials of the project assembled an information package to be sent to the heads of 40 equatorial nations, containing an "Earthport" brochure and background material on commercial launch services. A cover letter asked whether the country would wish to be considered as a host, provided it could meet design requirements for a spaceport. Responses from a dozen nations welcomed the idea. Throughout 1978, a variety of equatorial countries volunteered to open negotiations on designating a 200-square-mile area as a potential launch site, and providing extensive exemptions to investors to create a prosperous Earthport base for industry.

With this impetus, the project entered a new stage of development. The research expanded to include participants from dozens of countries. Besides such advisors as the head of the Brazilian space program, Dr. Nelson de Jesus Parada, and the president of the International Astronautical Federation for 1978, Professor Marcel Barrere, a host of space scientists and officials from other nations agreed to take an active role in planning potential Earthport-funded world space initiatives. Members of this planning group hail from Afghanistan to Venezuela. Since mid-1978, they have participated in the development of projects that could be supported by Earthport before rocket launches actually begin.

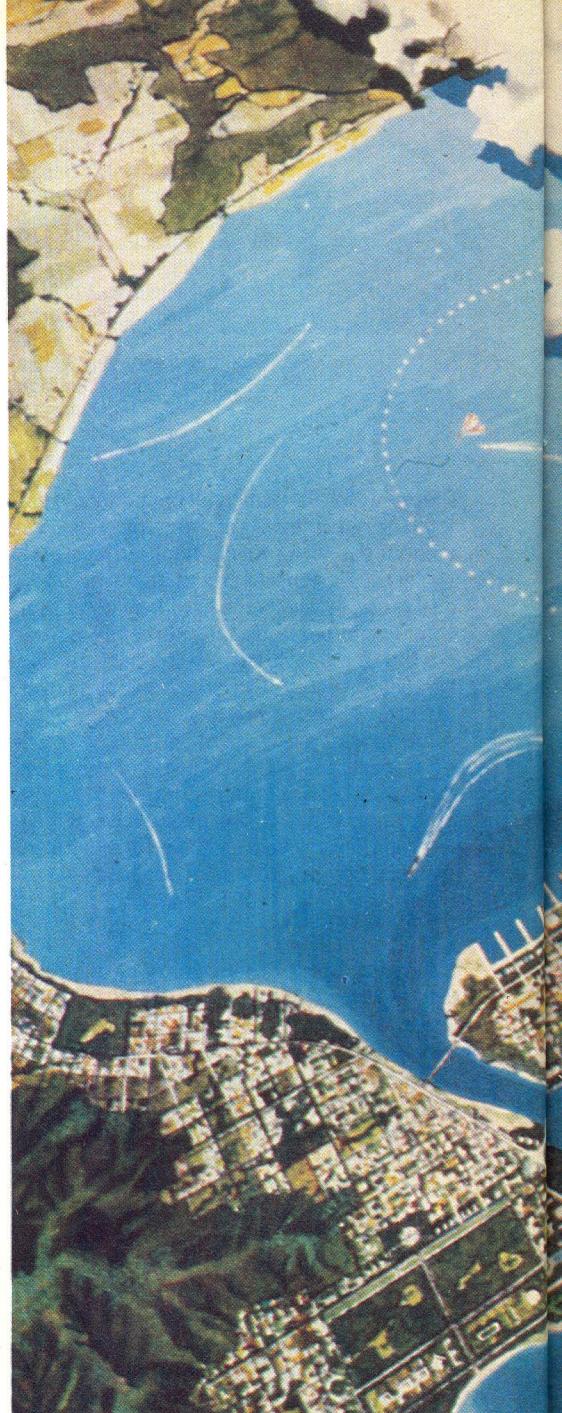
Initial activities under consideration by Earthport's world network of scientists include a new training center. Because many developing nations now lack skilled personnel to interpret Landsat imagery, which contains clues to environmental problems and hidden natural resources, Earthport Project members selected training as a high priority. An expert in Landsat applications for the developing world, Dr. Siyamak Khorram at Berkeley, took charge of a project to establish a Remote Sensing Institute, in cooperation with the University of California. The institute will offer both elementary and advanced courses once Earthport funds become available—and is being planned as a prototype for

future training centers abroad.

A second emphasis of the project participants has also begun to emerge: use of Earthport funds to make all nations part owners of space industry. After an Earthport is established—but before space launch activities begin—project members expect that considerable revenues will become available through lease of the free trade zone land. A portion of these funds may be used to buy stock in promising commercial space enterprises, among other endeavors. During the early years of such companies, part-ownership might be obtained by an Earthport investment fund at bargain prices; relatively small amounts of such money would also help boost high-risk ventures at this crucial stage. The investment fund might eventually reap windfall earnings from its early acquisitions, using the revenues to support new international activities in space.

Launch operations at Earthport are foreseen to begin with small, suborbital "sounding rockets," used for research into the upper atmosphere. Upon approval of Earthport's international participants, orbital launches could follow. At the outset, satellites are expected to be launched with expendable boosters. The launch zone, however, will have room for far larger reusable vehicles when such become operational. Gordon Woodcock, a leading planner for the Boeing Aerospace Company, recently joined the Earthport site selection group. His company has developed plans for "heavy lift launch vehicles," employing technologies now within reach, that promise to reduce launch costs to the point where space industries such as solar power satellites become economical. Earthport's planners will welcome operations by both private and governmental launch agencies.

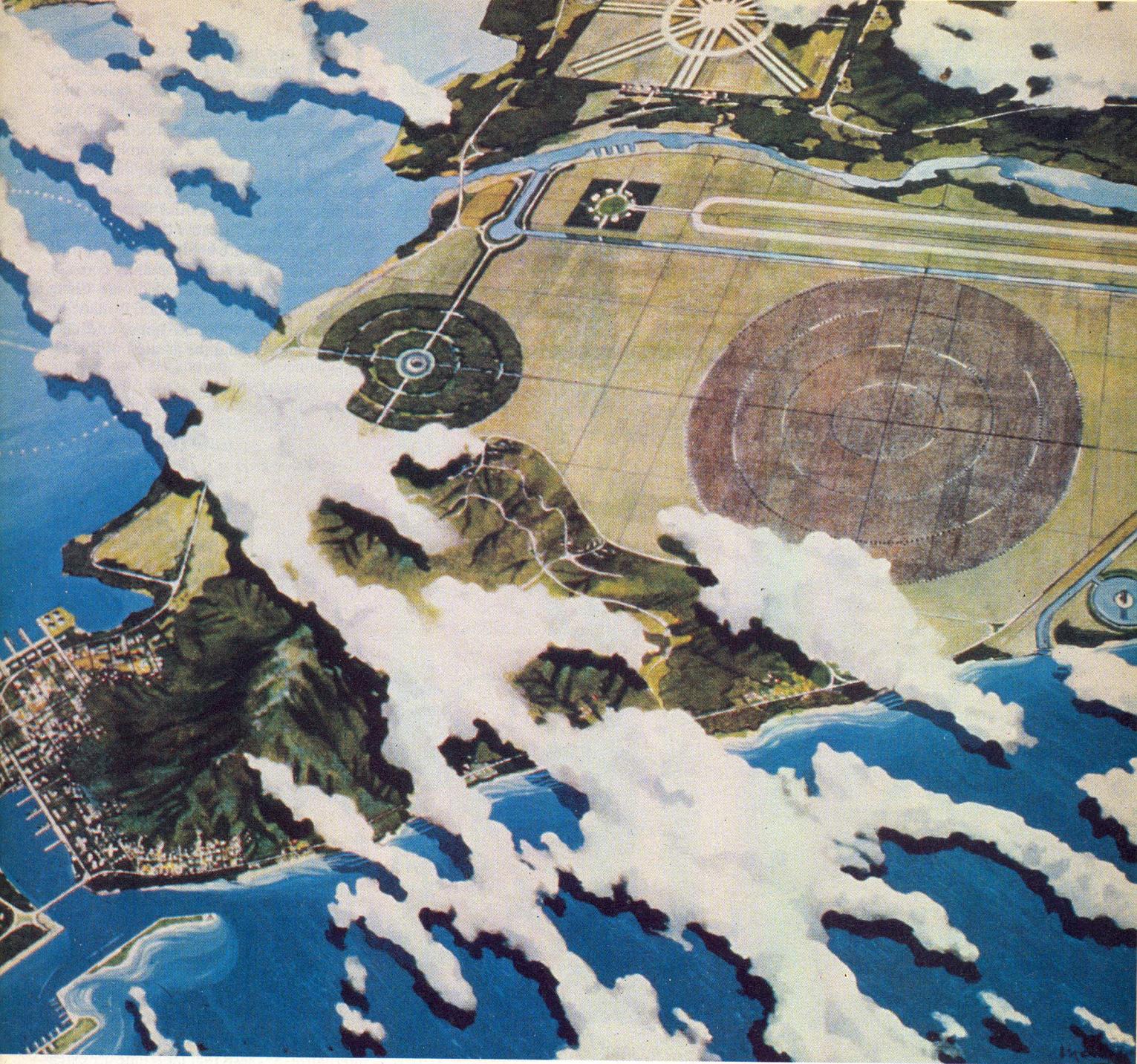
While the space-related aspects of the project have been taking form, the economic researchers have also been busy. Data has been collected on free trade zones around the world, and the study groups have expanded to include such experts of trade and technology transfer as Dr. Charles Okolie, a Nigerian-born legal scholar and advisor to the United Nations on multinational corporations. A large New York law firm, Chadbourne, Parke, Whiteside and Wolfe, has begun to prepare enabling legislation for Earthport that would make it a thriving center of commerce. Progress in researching the freeport concept has won approval in a variety of quarters. The Liberian represen-



ART. © EARTHPORT PROJECT

tative to the United Nations, Winston Tubman, offered an endorsement at a meeting of the UN Special Political Committee in October of last year. "We believe that a free trade zone mechanism of the type just described could be a means for generating finance to provide the impetus for the research, training, and other activities aimed at bringing the benefits of outer space to all nations," he said, "regardless of their stage of technical and economic development."

Project members are now engaged in serious talks with several nations about possible sites for Earthport. The potential locations are being scrutinized for suitability both as launch zones and free trade areas. At present, project researchers favor an area that is near the coast, sparsely populated, but adjacent to a railroad, a port and an airport. They believe a zone with inherent economic poten-



Earthport from the air. Spacecraft will be able to land either on a hard surface (circles) or in the water.

tial can "bootstrap" much of its own basic development, provided that proper incentives are available to commercial tenants. One scenario has Earthport offering its undeveloped land in the first year at a highly favorable rate, with an option for buyers to renew the lease indefinitely at the same constant dollar figure. Part of the money raised in the initial sale could be used for building up roads and other basic services, making new lease sales of tax-free land possible in following years.

Participants in the Earthport venture are encouraged by the progress they have made as an independent enterprise. "I doubt we'll have rockets going up for some years," says project director Frazier. "But we are making real headway with planning free trade zone operations, to make Earthport's early space

programs self-financing." Generous contributions from Arthur C. Clarke, Barbara Marx Hubbard and other philanthropists have sustained the initiative to date. Because research activities have grown to new dimensions with the negotiations over possible locations, the project is now seeking to widen its base of support. The vehicle for doing so is the World Space Project, an emerging grassroots organization based in Santa Barbara, California, that will work with supporters to promote Earthport and space industrialization in general.

Earthport has come a long way since that weekend meeting in 1976. The initial work done by a group of volunteer scientists, students, academics and businessmen has shown the project to be workable technically and economically. On the basis of these ef-

orts, interest in Earthport is growing around the world. "We see Earthport as a way to internationalize access to space, by lowering cost barriers and helping a 'live and let live' attitude prevail," says Frazier. "Trends are pointing to an inevitable need for a spaceport to serve the planet. Like other ideas of science fiction, it's bound to happen." Although project members hope that the leading space powers will take initiatives to bring about an international spaceport, the movement for Earthport isn't standing still. A world gateway to space is on the horizon.

The success of the Earthport Project depends on grassroots support. Tax deductible contributions are welcome at: Earthport Project, The Sabre Foundation, 221 West Carrillo Street, Santa Barbara, CA 93101.

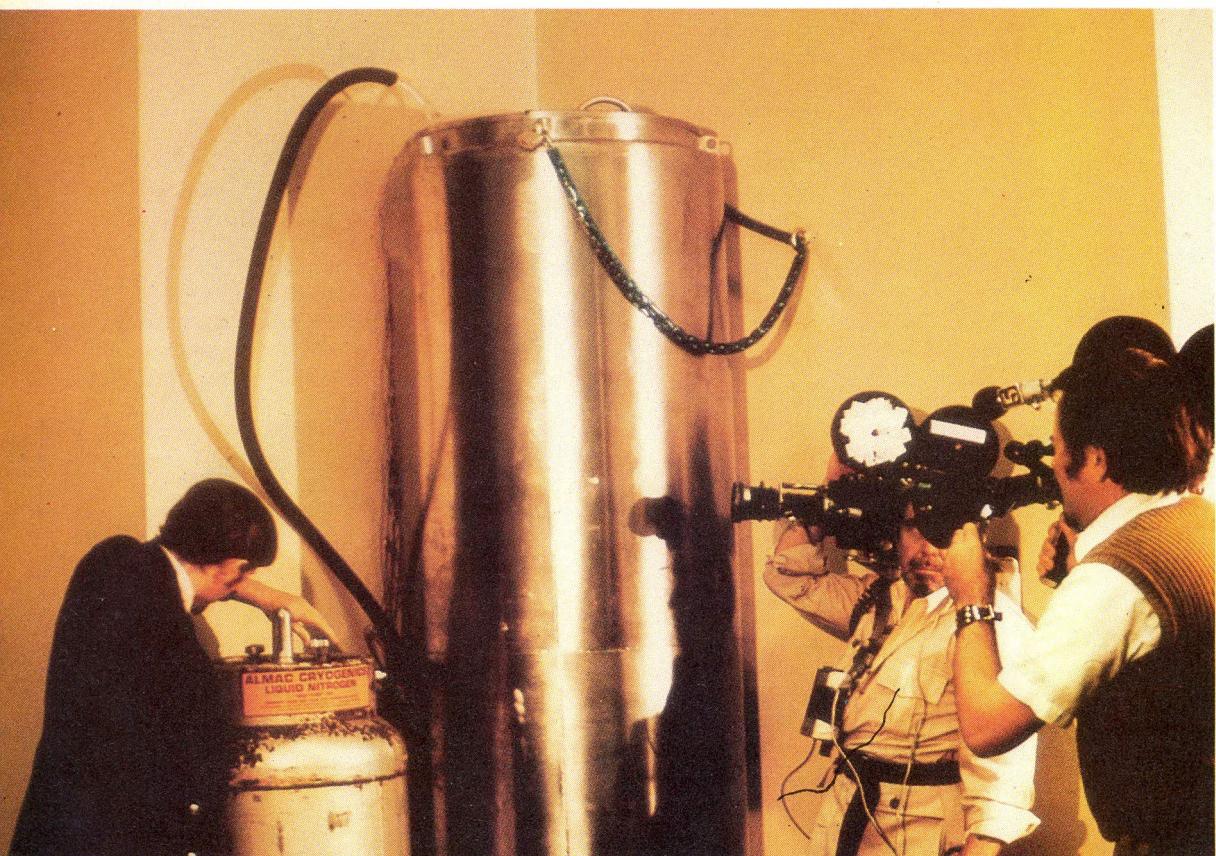
CRYONICS AND FUTURE PERSPECTIVES

Hope is created out of belief in yourself, which gradually extends to belief in others and belief that there's a sound, sane center to the universe, in spite of appearances. First of all, you've got to make a commitment to challenge, a commitment to risk, and be willing to pay the price of taking risks and going far out. And then you find that there are grounds for hope, because there are a lot of other people who are bold, visionary, turned on, and taking risks too. Humanity does not consist only of domesticated drones doing their jobs in the hive. Evolution is made by mutants who have doubt, hope, and charity—these three, and the greatest of these is doubt.

The Cryonics Society

The Prospect of Immortality, by physics professor Robert Ettinger, postulates that people living and dying now have a real, though presently unmeasurable, chance of indefinite life extension. He reasoned that current freezing techniques might preserve the essential biological and psychological information upon which individual life and personality are based. This is true even with imperfect freezing methods that are applied only to persons who are already medically and legally dead. An advanced future medical science might use the preserved information to restore the individual to active life, health, and youth.

PHOTO: © TRANS TIME, INC.



By ROBERT ANTON WILSON
and J.B. WHITE

Robert Anton Wilson is the author of more than nine fiction and nonfiction works, including the Illuminatus trilogy, which he coauthored with Robert Shea, and Cosmic Trigger. He is currently working on a three-volume comedy about quantum theory, Schrodinger's Cat, which will be published by Pocket Books.

J.B. White is president of the Bay Area Cryonics Society, a membership foundation, and a director of Trans Time, Inc., a commercial firm. These organizations promote and implement the preservation at cryogenic temperatures of the bodies of persons who have died of currently irreversible causes, with the hope that the remaining biological and psychological information may enable future science to restore them to indefinitely prolonged life, health, and youth.

Thoughts
on the
implications of
life extension
and immortality.

Once participants in the Cryonics program internalize the thesis that indefinite life extension is possible and worthy of attainment, they experience something of a liberation of consciousness. The strictures on awareness and achievement vanish, as if receding away at the speed of light, leaving a panorama of the waiting universe. They conceive this vision as a potential that *will* be actualized if civilization continues to progress. All diseases will be curable or preventable. Aging, the senescence due to the accumulation of years, will be preventable or reversible. Any damage caused by accidents, other than catastrophic destruction of the body, will be repairable. People will be able to live for hundreds, thousands, or millions of years. Perhaps true physical immortality will be realized. Humanity will expand throughout the solar

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system and the galaxy and the universe; in the process, humanity will become superhumanity. It will improve physiologically; more importantly, it will improve in consciousness, in awareness, in its grasp of facts and of the nature of the boundless reality around it. The Cryonics program for our period in history is a focal point and key link in the evolution of consciousness in the cosmos.

There are grounds for hope; the universe is huge. The immensity out there and the immensity of our ignorance give us reason to believe there are many potentials of which we are not even barely aware. We can tap these potentials to use for our own purposes, to improve ourselves and our achievements. The Cryonics program offers the prospect of participation not only in building our own future evolution but also in realizing its benefits. Ettinger formulated what he calls the First Theorem of Hope: It is always too early to despair.

Also, many of us dare to hope that we will never have to be cryonically frozen. That is, the present advances in life-extension research, by scientists such as Dr. Bernard Strehler, Dr. Paul Segall, and hundreds of others, give us grounds to believe that a chemical cure for aging will be available in the next 10 to 15 years. There's an excellent chance that the first longevity drugs will come along soon enough to give us each another 100 or 200 years of life, and in that time further research will almost certainly give us much longer—fantastically longer—lifespans.

Life After Death

Early efforts to revive drowning victims were ridiculed and stigmatized as blasphemy for their obviously diabolical attempt to bring people back from the dead when God had chosen otherwise. Everyone knew that when someone cold and blue was hauled from the water, God had called the soul and sent it whithersoever He desired, and that it was not only useless but blasphemous to attempt revival. The resuscitation methods used were inadequate, but they actually began to succeed in reviving drowning victims. The furor eventually subsided, as the concept developed that the victims just weren't really dead. Before, individuals in such conditions were thought to be dead, but obviously the ones revived were actually alive all along.

Similar reactions to medical advances have continued up to the present, even in response to the Cryonics program. If the information on which life and consciousness are based is still present in the cryonically suspended patient, then the individual is in a deep coma and at least potentially alive. If the information is dissipated or destroyed, from whatever cause—whether by a purely physiological process or by God's having severed the essential connection—then the person is dead. Not even the most learned theologian of whatever religion—Buddhist, Christian, Islamic, and so on—who believes in some sort of spiritual existence apart from the body, would claim to know the precise nature of the relation between spirit and body or the conditions under

which that relation is dissolved. No one knows exactly when this transition from enough to not enough information may occur, though science gives many grounds for optimism that essential structures may be much more resistant to damage than is usually believed. Our ignorance and the value we have for individual conscious life impel us to behave just as we would if we knew life still to be present but gravely in peril. Cryonic procedures aim to preserve and extend that life.

Some cryonics believe in the soul and in spiritual life after its dissociation from the body, but they are nonetheless choosing the option of cryonic suspension for themselves. Many religious leaders are favorably inclined toward the Cryonics thesis. They say that physical life is sacred, a gift from God, not to be relinquished unless the reasons are very good indeed. We do not consider the diagnosis of medical death by an attending physician, relative as it is to our continually changing contingencies of time, place, knowledge, and technology, to be sufficient reason to make us give up hope and effort.

The life-extension sciences use the concept of "identity reconstruction" to refer to a hypothesized technique of extending life by reconstructing personality and memory when an individual's physical remains have been so damaged that the usual projected method of repair would not be applicable. A severely damaged brain, for instance, would not be simply revived, but the personality and memories might be reconstituted by using the intact information. This might involve a transfer of consciousness and personality into a cloned or even artificial brain by means of a causally continuous cybernetic mapping that preserves the quantum relations of information contained in the weave, RNA, and DNA or the original neurons. Just as transistor technology could not have been envisioned even a hundred years ago, so the

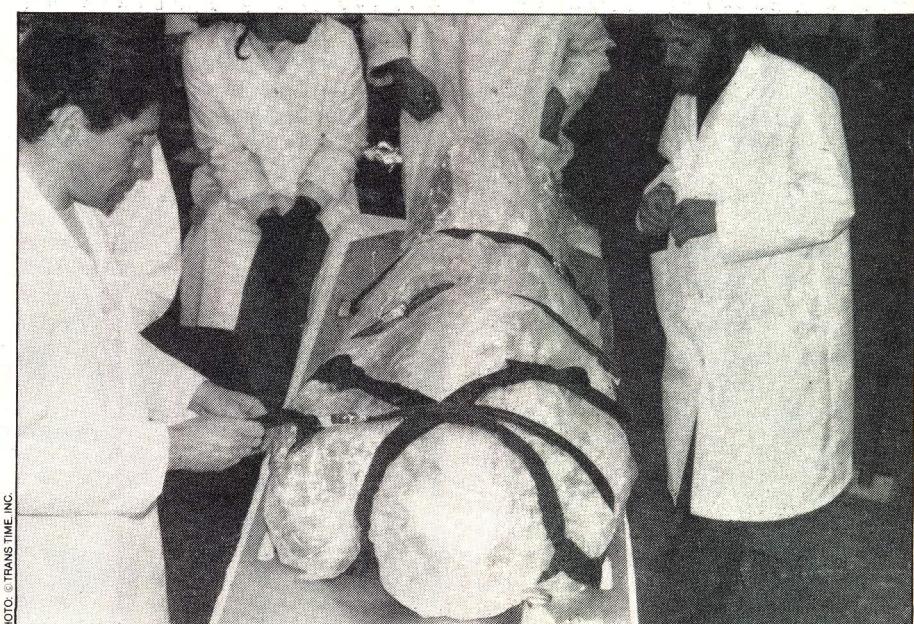


PHOTO: © TRANSTIME, INC.

In order for a patient to be properly readied for cryonic suspension, the body temperature must first be brought down to the temperature of liquid nitrogen.

future will conceive and implement strategies we cannot dream of today.

From another perspective, there are lots of approaches to an identity. It's quite possible that the sort of central galactic computer or the brain of the energy-shunting system can have these personalities on tap, and whenever the genetic roulette wheel spins around to the right place, they come up again on a particular planet. In other words, if the personality is basically information, mathematically considered, that is not very far from the theological term "spirit" or "soul." We're talking



In the final stages of the cooling process, the patient is wrapped and strapped to a stretcher. He is now ready for encapsulation and long-term storage.

about coding, and that can reappear in many ways, so that people who claim to remember past lives may well be remembering the genetic archives. This is what Dr. Leary calls the seventh circuit of the nervous system, the neurogenetic circuit in which you can remember the DNA archives. This information is always potentially available, so that somebody who has been cryonically frozen can reappear in many forms, besides the one in which the cryonic suspension is ended and they're revived. In other words, identity is not that intimately connected with the body.

To put it another way, inside every cell of your body is a very complicated DNA code, which contains all the information that decided how tall you were going to be and what color eyes you would have and so on. This coil appears inside every cell of every living creature on this planet. This is sort of the evolutionary strategy computer that's been operating for the last three and a half billion years. It obviously knows a lot more than any human brain. From a certain perspective, as Mueller, the geneticist, says, we're giant robots created by the DNA to make more DNA. Tim Leary would say, to make better DNA.

The data of mysticism, the data of memories of past lives, can be accounted for by Leary's theory of a loop between the nervous system and the genetic code: that you are capable of remembering things that don't happen to this nervous system, but actually

happened to other nervous systems the genetic code had created. Out-of-body experiences are easily accounted for in terms of Leary's eighth circuit, which is the neuroatomic, metaphysiological circuit. Just because you're out of the body doesn't mean that you're out of physics; you're just metaphysiological, not metaphysical. The same theory has been proposed by such physicists as Dr. Evan Harris Walker, Dr. David Bohm, Dr. Jack Sarfatti, and others.

Future Prospects

We're all living on a planet that has reached the point where we can no longer afford to have any people who are being oppressed or who even *think* they are being oppressed. The potentials for violence and destructiveness are absolutely shattering. Nobody is safe, not even people with as much money as the Hearsts. There's no place to hide. We've got to face up to our responsibilities, and realize the only remaining options are Utopia or

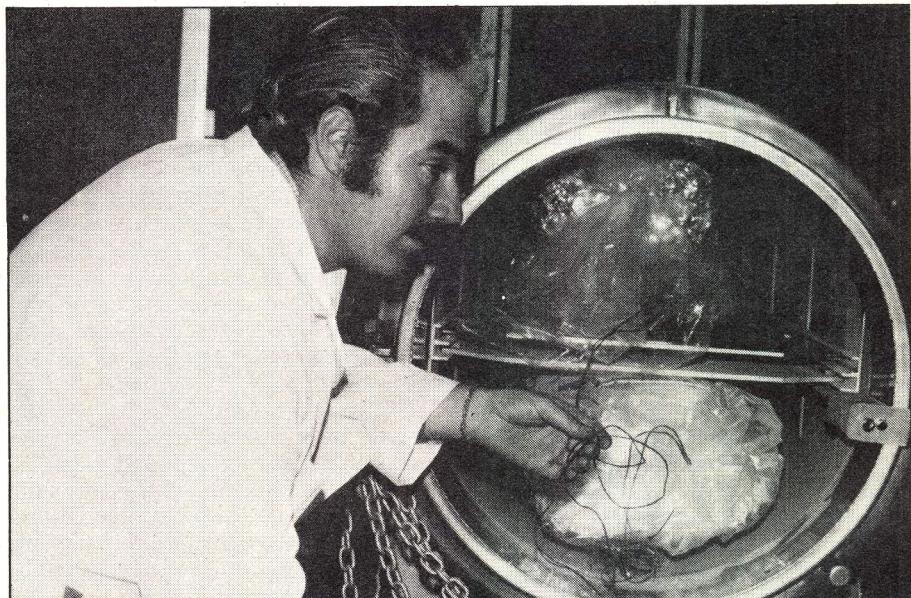


PHOTO: © TRANS TIME, INC.

Trans Time president Art Quaife examines two patients just placed in storage.

Trans Time

Seven human beings are now in a state of cryonic preservation. They have been frozen to a temperature of extreme cold in the hope that, at some future time, science will have progressed to the point where they can be thawed, cured of whatever caused their death, and restored to full health and life.

Until that time, their bodies are being cared for by Trans Time, Inc. With two locations in California, one in the Los Angeles area and the other in Berkeley, Trans Time can be considered the major cryonics facility in the United States. Approximately 80 people have signed up to date to have their bodies placed in frozen suspension; among them is Art Quaife, head of Trans Time.

Cryonics, the science of low temperature preservation of humans, is predominately the brainchild of Robert Ettinger, a professor at Highland Park Community College, Michigan. What began in the late 1940s as a process for the freezing of sperm had, by 1964, been extrapolated by Ettinger to encompass the possibility of preserving an entire human body for later revival. Ettinger published his thoughts in *The Prospect of Immortality*, a book which eventually found its way into the hands and mind of Quaife, then a graduate student in mathematics at the University of California at Berkeley.

Quaife teamed up with other "immortalists" to form the Bay Area Cryonics Society in 1968. For four years it was run as a non-

profit society whose purpose was to conduct studies in cryonics. By 1972, they decided to turn theory into reality by forming Trans Time.

The reality of cryonics begins, for the patient, as soon as the physician declares him/her "clinically" dead. (Naturally, because of the uncertain nature of the procedure, no one is being frozen who has any chance of survival through today's methods.) In other words, the optimum freezing point is after the heart and lungs have ceased to function, but before actual biological deterioration of the tissues has begun.

Trans Time members wear a Medic Alert bracelet to inform physicians that the cryonics procedure is to be followed. The

body is immediately attached to a heart and lung resuscitation machine which will keep oxygenated blood circulating. It is surrounded by ice packs and, thus encased, is flown to the cryonics center laboratory.

The patient's vascular system is flushed with a cool salt solution, which brings the body down to four degrees centigrade. At this point, the patient is injected with a dimethylsulfoxide solution to prevent the tissues from damage by the extreme low temperatures.

The final stage is initiated after the body's temperature has reached -79 degrees centigrade. Still cooling, it is then placed into the final storage capsule, a stainless steel unit with vacuum jacket insulation, filled with liquid nitrogen to maintain the body's temperature

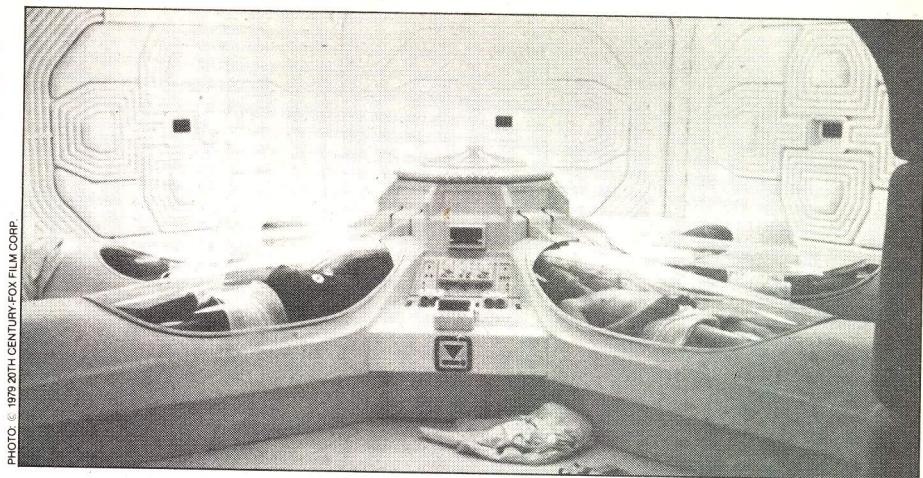
Trans Time, Inc., one of the major cryonics centers in the U.S., offers anyone who is willing, the chance for a second chance.



PHOTO: © TRANS TIME, INC.

oblivion. Plutonium is missing, for instance. There's a jolly group that calls themselves "The National Committee to Overthrow the Government Next Tuesday After Lunch," who are sending out schematic diagrams on how to make an atomic bomb at home. At the trial of Captain Crunch recently, he got a sentence cut from four years to three months for telling the government how he managed to tap the supposedly fail-safe untappable lines of the White House, the CIA, the FBI, the Pentagon; how to get into bank computers by telephone and shift a million dollars from one account into another; how to fire missiles by telephone and start World War III. He showed them how to build in more fail-safes to prevent the kind of thing he discovered he could do; but, of course, the next one along can find a way over Captain Crunch's fail-safes. We have got to develop a sense of responsibility, and realize that a just, happy society is not a luxury but a necessity.

A person can realize that all of these things we have discussed are scientifically possible. As long as you're talking religion or metaphysics and so on, people have a chance to ignore it and get off the hook and say, "Well, that's all unproven." We're talking about things that can be done practically. And once you internalize these possibilities, then the enormous stupidity, the enormous waste, and the enormous threat involved in continuing our habitual ways of thinking become obvious. You don't need to take a psychedelic once you



In the film *Alien*, astronauts survive long space voyages in cryonic suspension.

have internalized these ideas. You don't need a psychedelic to become aware that every moment is important, that every decision is important, that every human being is important. We are all contributing to the ledger on one side or the other. We're all contributing to the amount of violence, hatred, prejudice, brutality, in the human experiment; or we're contributing to the other side, toward love, intelligence, tolerance, forbearance, and all the traditional works of mercy recommended by Thomas Aquinas. But we're definitely contributing every minute to one side or the other, and within this next decade, or the

next five years, very important decisions are going to be made.

We are going to have longevity and eventual immortality; we are going to the stars; we are going to transcend all of our previous levels of consciousness and intelligence. Or we are going to end this experiment on this planet, this life experiment that has produced so many beautiful things, from Beethoven's music to the bluejay that lands on the tree and sings for you. It's an awfully stupid time to blow the whole show when we've got greater potentials than we've ever had before. What's really behind the whole SMI²LE program is making people aware of this. Every person matters; nobody is unimportant any more. And every living being matters, and every decision matters, and every minute is going to be full of love and hope, if you want it that way, or full of negativity, if you want it that way.

Penology

Consider the problem of penology in terms of life extension. How long can you keep people in prisons before everybody thinks it's abominable? Can anybody contemplate a 700-year prison sentence? It's occurred to me that when life extension becomes commonplace, penology is immediately going to go into two extreme schools. One will say, Execute all, right and left; we're not going to support these thieves and murderers through a hundred years, 200 years, 700 years, 1,000 years, or whatever. The other extreme will say, Life is so precious that we can't contemplate destroying it, and certainly we don't want to keep people caged for that long. A thousand years in a cage is an inhuman concept, and it's expensive for us as taxpayers, too. So we've got to find a cure for these problems. The abolition of poverty is the first major step toward solving those problems, but it's not the whole answer, of course.

Tim Leary has suggested that we should abolish all crimes without victims in the first place, which is an ordinary libertarian position which makes sense to everybody except puritanical fanatics who are constantly haunted by the fear that somebody somewhere might be having a good time without

(continued on page 66)

at a steady -196 degrees C (-320 degrees F). At this temperature, according to Trans Time, "typical biological processes that require one second at normal body temperature (98.6 degrees F) would take more than 30 trillion years at the temperature at which patients are stored . . ." Normal deterioration is stopped, until some undetermined future time when the condition which caused the "death" can be cured or reversed.

This process is not only reserved for physically intact bodies. Only four of the hopefuls now in cryonic suspension are in what is called whole body preservation. The other three are neuro-preservations—the brain (or the entire head) has been frozen in the event that future science will be able to transfer the brain to a new body or, perhaps, somehow transfer the neurological impulses that make up a personality to a clone of the individual.

Improbable? Perhaps. And the people at Trans Time are giving no guarantees that every (or any) person who undergoes cryonic suspension will eventually be revived. The science of cryonics is still new; there may be problems that have not even been discovered yet. The company's answer? "If you are *not* cryonically suspended, you will *never* be brought back to life. However, by extrapolating from the fantastic medical advances of the past, we can envision a time when technology can repair almost any damage caused by today's less-than-perfect freezing procedure."

Even now, according to Art Quaife, the technology for insuring successful preservation is improving. Just last year, significant steps forward were made in increasing the efficiency with which the necessary chemicals are introduced into the patient's bloodstream. Trans Time's southern California laboratory now has its own research surgeon and the complete facilities needed to carry out cryonic suspension (their main center is in Berkeley).

All this medical equipment, not to mention the skilled people needed to operate it, does not come cheaply. The total first-year cost per patient has been estimated at \$12,600; afterwards, there is a yearly storage charge of \$2,000. To offset these costs, Trans Time has established as the initial price for its services a membership fee of \$1,000, plus a recommended minimum life insurance policy of \$50,000. These funds are destined for an interest-bearing trust fund. While the bulk of the money will be used to pay for long-term storage, Trans Time says that enough will be left over to provide the newly-awakened patient with a very healthy bank account.

Interested? Trans Time is willing to share its facilities with anyone who has the inclination and means. For more information, contact Trans Time, Inc., 1122 Spruce Street, Berkeley, CA 94707; phone (415) 525-7114. And, perhaps, I'll be seeing you later.

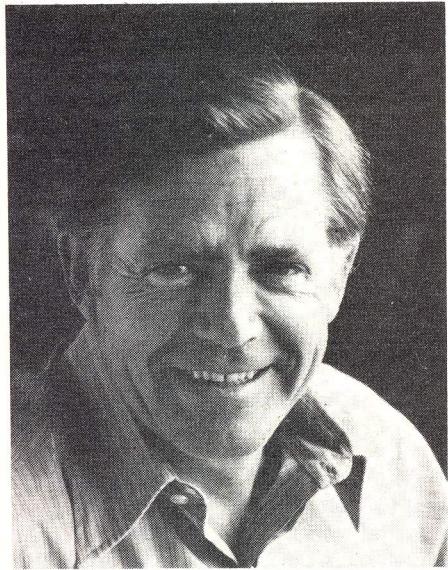
Much later.

—Barbara Krasnoff

PORTFOLIO

Jack Olson

While he's painting visions of the future, this aerospace artist helps design it.



By CAROLYN HENSON

One of today's top space artists, 56-year-old Jack Olson, insists, "I don't think of myself as an artist." He's an engineer for Boeing Aerospace, and he sometimes gets carried away with his design sketches. In addition to painting intricately detailed visualizations of future technology, he's an active participant in the design processes.

Jack Olson is best known for his illustrations of solar power satellites. Power satellites would convert sunlight to electricity and beam it down to Earth via microwaves. Each powersat, a Manhattan-sized behemoth, could generate enough electricity to power Los Angeles.

One of Olson's power satellite paintings, showing its construction in low Earth orbit, is hanging in the Smithsonian Air and Space Museum. Reproductions of his works have appeared in German and British publications, and dozens of U.S. newspapers, magazines, books, encyclopedias and TV shows.

Jack got into his field in a roundabout way. "As a young farm boy standing ankle deep in dust, with Russian thistle blowing by," he remembers, "I decided I damn well didn't want to be a farmer! I hated milking cows, so I made a deal with my dad that if I never had to milk a cow again I would be happy to work in the blacksmith shop.

"I decided what I wanted to be most of all was a flyer. That's my first love. So I decided I'd join the Navy and get into their flying program. But then I saw what the uniforms looked like. I figured that with my stocky build I wouldn't look very neat in a Navy uniform. So I decided I'd better try the Army Air Corps. Their uniform just seemed to have a better fit. "I'm being a little facetious . . ." he admits, smiling.

"Actually, I joined the Air Corps because I thought I'd be able to run out my whole school year at the University of North Dakota, but it turned out the Army Air Corps didn't keep their promises. I was immediately accepted and started their cadet training. I wound up being a B-24 instructor."

But it wasn't exactly smooth sailing all the way. "I had a mid-air collision! I had just taken off from Offutt Air Force Base in Omaha, Nebraska," he recalls. "I had a bunch of sailors on board who were getting a ride, as well as the crew of another airplane, so I had quite a few people on board. I had just taken off and couldn't see because I was flying directly into the sun, so I asked permission to leave the traffic pattern.

"Just as I was leaving the pattern and banked my wing, another aircraft that was a mile off course hit me and knocked about 15 feet off the wing.

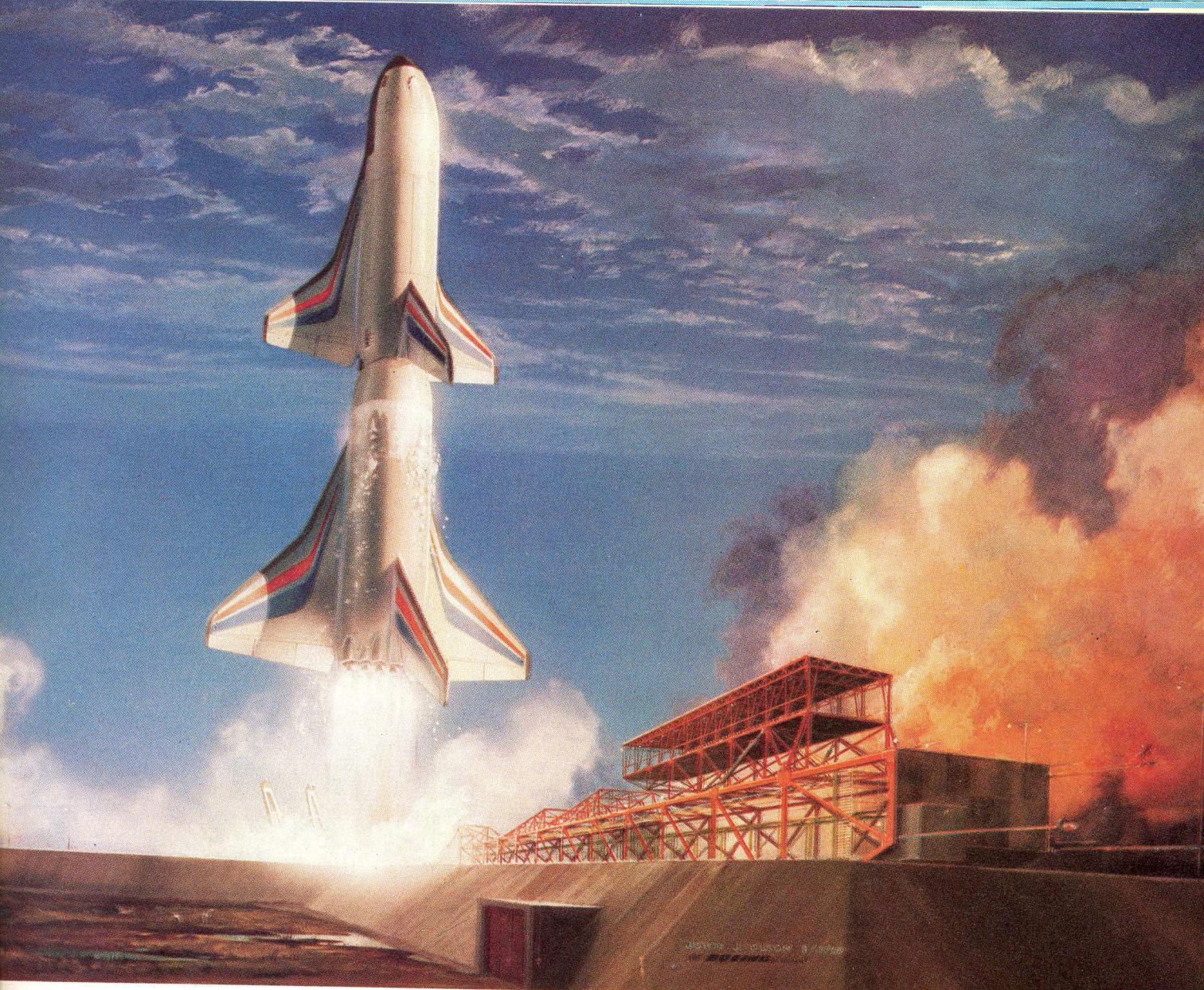
"I was hanging on two engines on one good side. The ship started to spin, but luckily I caught it in the nick of time and managed to straighten it out. I couldn't really turn the aircraft but I got control of the downward spiral. I saw that if I was lucky and timed my spiraling descent, I might time it to get to the airport.

"I was losing altitude and my airspeed was about 250 mph. I just missed a prisoner-of-war camp coming into the airfield. I was so low I knocked the boards off the security fence." He draws a deep breath, remembering the tense moments.

"Anyhow, I did manage to land it. I was going 250 mph at the time." That's 40 mph faster than the space shuttle lands.

What thoughts crossed his mind during the harrowing crash landing?

"Well, I thought I had bought the territory



A two-stage space freighter designed by Boeing which could carry almost a million pounds to orbit. The entire vehicle is reusable.

at the time. But I will tell you that strangely enough the only thought that crossed my mind—and it was only momentary because I was very busy, there were lots of things to do—I was thinking I wouldn't make it home for dinner that night and my wife would be very angry.

"So those are the famous last thoughts you have as you're about to die!"

After the war Jack decided that, even though "flying is my first love," he'd someday flunk his physicals and be an out-of-work pilot with no other skills. So he turned down a job as a pilot for Western Airlines and went back to school at the University of Minnesota to study design engineering.

After graduation Jack went to work for Boeing. Although Boeing is best known for its aircraft and space work, Jack's first project was a hydrofoil boat. (He's named as co-inventor in the patent on the project.) After his work was completed, Jack managed to get assigned to the Boeing preliminary design concepts group, where he worked on "everything from spacecraft to aircraft to god knows what."

While working with that group, Jack met Gordon Woodcock and Dan Gregory, Boeing engineers who were studying solar power. They saw Olson's work and liked it, so they started bootlegging his time for some of their projects.

That trio of engineers was most excited by the solar power satellite. So when the preliminary design concepts group folded, Olson, Woodcock and Gregory requested and got the Boeing okay to work full time on powerstats.

Jack Olson's major interest in the project is the Earth-based rectifying antennas (rectennas) that receive energy beamed by the orbiting power satellite.

"Some people are concerned that for every satellite we must have a way of receiving that energy from the satellite, and it will effectively take up 30 to 35 square miles of land," Olson explains.

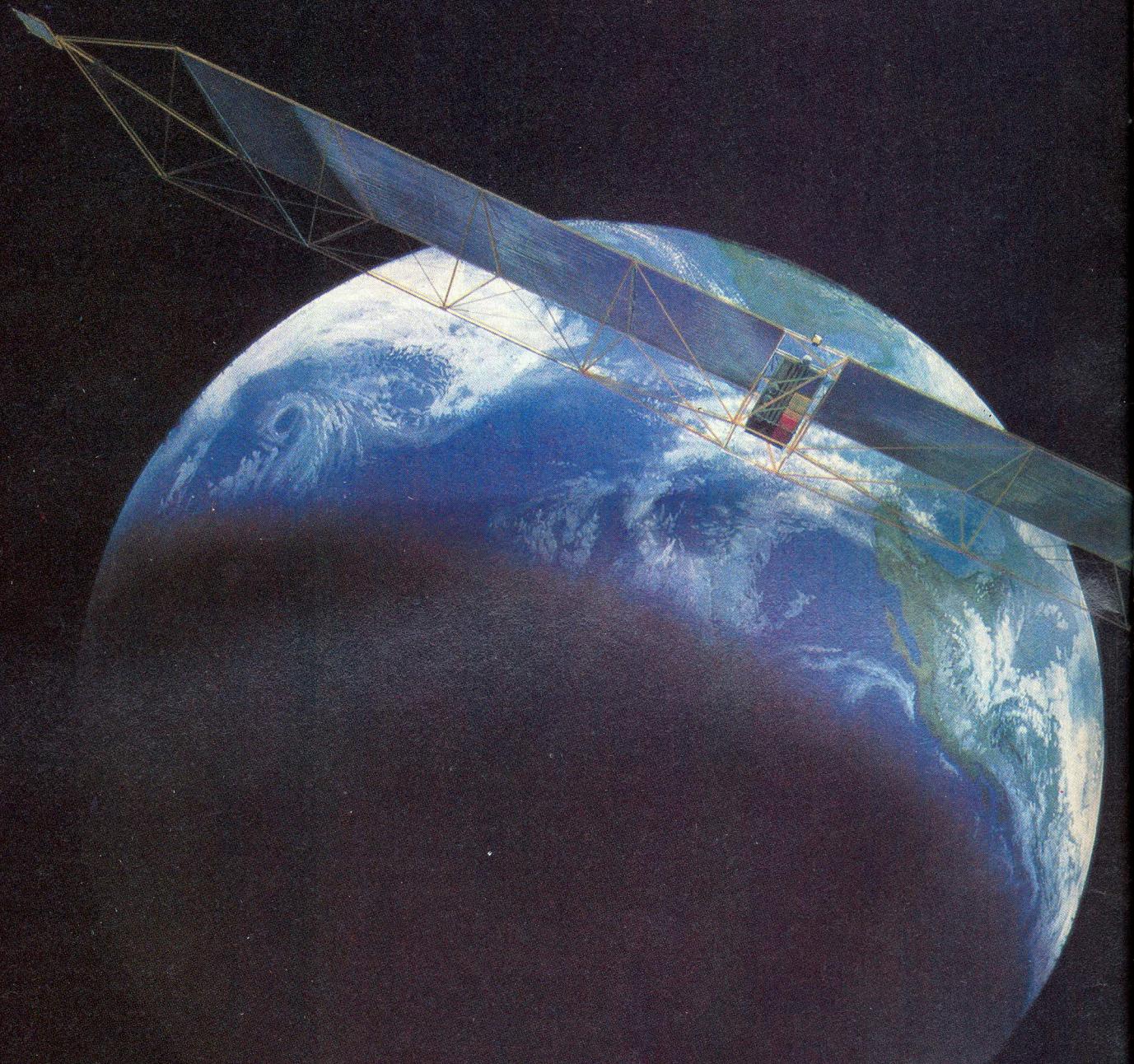
"We just can't lose that much land. I'm one of those people who is referred to sometimes as one of those 'goddamn environmentalists!' I'm very proud to be a god-damn environmentalist. The only negative

note that I've had so far on solar power satellites was that this rectenna is going to wipe out so much of our land. And I didn't want to be a contributor to something that was going to destroy so much land. Then somebody suggested that we can use that land underneath the antennas. It doesn't have to be lost," he explains.

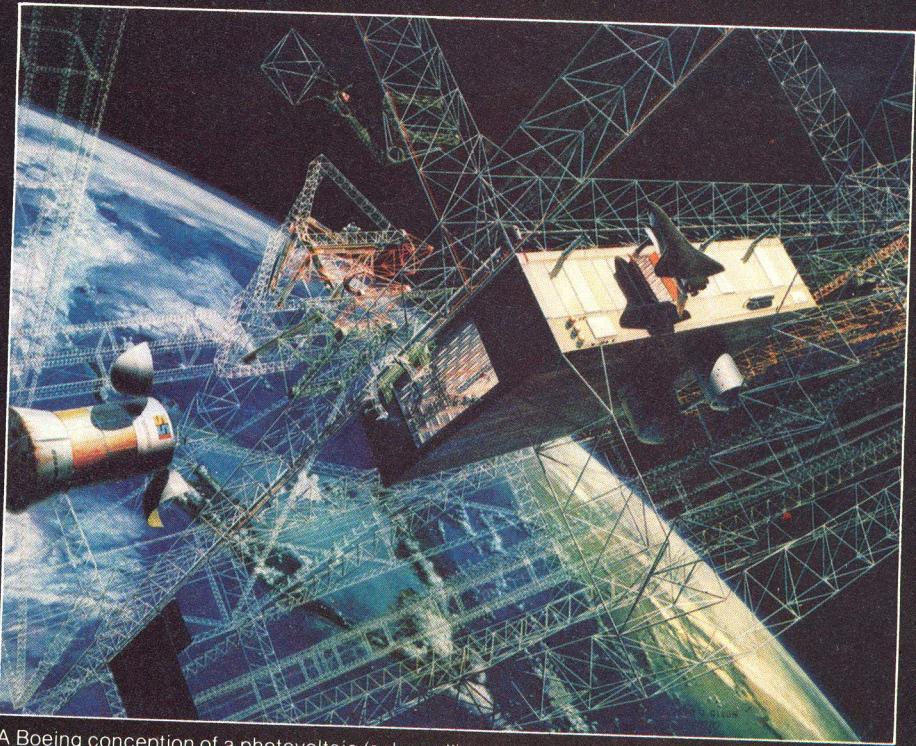
"We could just add some glass to the rectenna and construct the world's most gorgeous and most efficient greenhouse. It could have very specialized equipment in it for high intensity farming or raising vegetables or special crops underneath this antenna. We could use the energy we get from the solar power satellites to heat and control and to take care of this place.

"I feel that, with 35 square miles of area and intensive farming under the rectenna, we could feed as many as one million people. I get so excited I get itchy! We have a lot of experts that can work on the spacecraft. Now I want to get back to farming." He smiles thoughtfully. "Yes, I've come a complete full cycle. There's something symbolic in that."

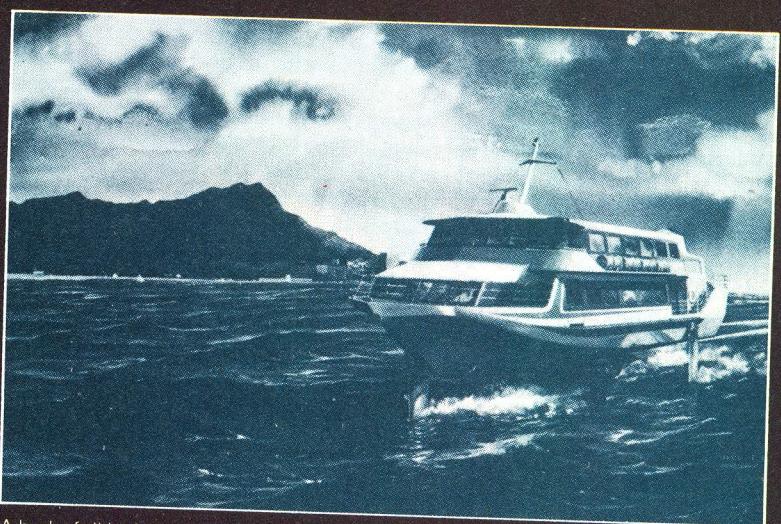
Around the Seattle, Washington area



Electric orbit transfer vehicles like the one pictured here will be used for moving things around in space relatively inexpensively.



A Boeing conception of a photovoltaic (solar cell) power satellite being constructed in low Earth orbit. A shuttle orbiter docks at the assembly bay with a load of construction material. At left is another Boeing concept for a heavy lift space cargo freighter.



A hydrofoil jetfoil boat, with Diamondhead, Hawaii, in background. The hydrofoil was Jack Olson's first design project with Boeing.



ART. JACK OLSON, COURTESY BOEING AEROSPACE CORP

Olson's idyllic view of a five-mile-wide power satellite receiving antenna, with the land underneath being used for farming.

where Jack and his wife, Georgia, have raised five sons, Jack may be better known for the parties he throws than for his pioneering work on power satellites.

"I have friends and once a year I usually think of something that's fun for a whole bunch of people to do."

"This year we went to eastern Washington with several buses and had an eclipse tour. I really lucked out in that case because there was cloudy weather. But I was counting on a meteorological effect known as a 'wave window' which would make a hole in the cloud in certain areas downwind from the mountains. The window appeared right on schedule," he beams happily.

"We had a fantastic view of the eclipse. We got lots of neat pictures."

He recounts the inspiration for another landmark gala: "While flying a glider I discovered a waterfall in eastern Washington that looked so attractive right out in the middle of nowhere in the scablands country. I visited the waterfall after I had landed the glider and discovered that it was a tiny little vest pocket state park there called Summer Falls. So last summer we held the first internationally famous 'In The Middle of Nowhere Picnic.'

"And back in 1976, I thought the country hadn't been doing a very good job of celebrating our 200th anniversary," he grins. "No

one had put together an all-American type picnic so I decided the heck with it, we'll have one and, although I didn't know any balloonists, I decided a picnic would look very good with some balloons. So I conned a good Irishman who happens to run a state park into letting some balloons come. I held a picnic and invited our friends and some people to come and attend and ride in the balloons. We had a bunch of hot air balloons. We had kayak trips down the river going simultaneously and some of my friends ran an airshow, flying old WWI type replicas.

"We gave 290 balloon rides that day. We had a balloon picnic again the next summer."

Jack is a notorious practical joker. In the mid-1960s, George Stoner, who was at the time head of Boeing Aerospace, asked Jack to paint him some lunar landscapes. This was before any of the Moon landings, and Mr. Stoner wanted to show Congressional committees and professional groups what the surface of the Moon looked like.

"I sneaked a bleached-out cow's skull into the picture without telling him," Olson chortles. "He was up in front of the audience showing the pictures when somebody started to snicker and giggle and he wondered, 'What's going on?' Then he discovered I had slipped that in on him. His reaction was, 'I've got this doggone artist who's always playing some joke on me.' The audience reaction was

so great that he went through that routine every time he presented it."

What kind of future does Jack Olson want?

"I have pretty strong opinions. The future of mankind, if we are to have a future, will be to recognize that our world is finite. Our population is already too large. I don't say that we will have zero population growth, we will have a negative population growth, a phasing down of the world's population, because as long as we continue to consume resources, and aren't putting any back, eventually we're going to run out."

Does he want to live in a space colony or fly one of the giant space freighters he paints?

"I've given some thought to that," he shakes his head good-naturedly, "but I happen to be the kind of person who feels claustrophobic in Montana."

Where, then, does Jack Olson see himself in the future, some 20 years from now? He points to his painting of a power satellite receiving area. Beneath it are the fields of the farm he's designing, a farm far different from the ankle-deep dust and rolling tumbleweeds he hated as a boy.

"If you look underneath, in that lower left hand corner, you'll see some clouds and underneath one of the smaller main clouds, not the smallest, you'll see a glider."

"That's me."

Earth Control

(continued from page 19)

fleet on the high seas; when the whalers spot a pod of whales and race off in pursuit, Greenpeacers launch a flotilla of small rubber boats and position themselves directly between cannon-fired harpoons and the unsuspecting cetaceans. In some instances, the hunters retreat and whales are spared. Just as importantly, the world watches on TV as these "crazies" risk their lives for those of the whales. And the public is impressed.

Likewise, Greenpeace has brought attention and dissent to the annual slaughter of harp seals in Newfoundland. With a quota of 180,000 seals, commercial hunters from Norway and Canada and native Newfoundlanders equipped with specialized clubs, go after their unwitting prey. Most prized are the one-to-three-week-old pups, whose snowy white fur is fashioned into trim for boots and gloves and, ironically, toy seals. Greenpeacers have been arrested for placing their bodies between the deadly clubs and the pups. Unfortunately, the seals are later clubbed and skinned, but the arrests still make the nightly news—mission accomplished.

So what is gained by saving some whales and seals? Does this constitute preserving Earth? Greenpeace sees it more as a public consciousness raising. The feeling is that the continued destruction of species could have irreversible, detrimental effects on the natural balances of nature, i.e. removing important links in food chains, disrupting of life-perpetuating gene pools. And what if we were to destroy some seemingly insignificant plant that might have someday produced the cure for cancer?

Dr. Patrick Moore, president and co-founder of the Vancouver chapter, expresses Greenpeace's *raison d'être*. "Our central philosophy is to affect the course of history on important matters of the environment and the preservation of it and to do so in a non-violent and peaceful manner; through direct action which gives it the dynamic it has."

Dr. Moore states that, while protecting ecosystems is tantamount to Earth's survival, individual members of species also must be appreciated. "Each species is an integral part of the ecosystem. Species is just a concept. It is actually the individual animals in a species that are the real thing. It's important among human beings to relate to the individuals. It's more a matter of elevating the other animal and plant species, elevating them to the level of people—or the converse: Bring people down to seeing that they are not above the level of these other species."

Greenpeace has many chapters and support groups around the country, far too many to list here. But if you're interested in finding out how you can get involved with the group in your area, write to: Greenpeace—New York, PO Box 1474, Brooklyn, NY 11202. They'll let you know whom to contact.

Elevator To Orbit

(continued from page 45)

Launching payloads by the orbital tower technique would include none of the trappings of normal rocket flights. Gone would be the ear-deafening roar of rocket engines as well as bone-shaking acceleration. People could be lifted and experience minimum g-force reaction. A tubular, human-carrying elevator to space would be about 10 feet in diameter, housing electrical coils which would push passenger capsules to a maximum velocity of about five miles per second. The entire trip to geostationary orbit would take just four hours, about the time it takes to fly across the United States in a 747 jetliner. Low-priority (non-priority) cargo-carrying capsules might involve motorized capsules with wheels to simply "climb" the tower into space, taking days or even weeks for the trip; in this case the speed of each capsule doesn't matter, only the number arriving per hour.

It is conceivable that an orbital tower could be constructed on Mars as well, creating a transportation link between the two planets. Payloads would then be elevated off Earth, released at the proper time, cross space and rendezvous with the Martian tower, supplying needed material to a Mars base. (This concept is explored in a new novel by scientific SF writer Charles Sheffield, *The Web Between the Worlds*.)

Recently, Pearson has pulled his idea up by the roots and planted the concept on yet another celestial body—the Moon. Mathematics suggest that an anchored lunar cable would be far easier to construct than a cable connected to Earth. The lunar tether could be made of high strength materials that now exist. A cable firmly attached to the lunar surface might supply a Moon base, or provide a communications link to the Moon's far side.

With increased interest in utilizing lunar ores for space colony industrialization efforts, the Moon-attached cable could transfer thousands of tons of needed lunar matter for use in space. The anchored lunar cable would offer an economic and more efficient alternative to the Moon-based "mass driver" first proposed by Arthur Clarke in 1950 and recently developed into a feasible system by Princeton professor Gerhard O'Neill.

As with all new ideas, much research is needed to validate the promise of Pearson's work. As of now, there exists no material strong enough to build an Earth/space cable. Suggestions have been made that a blend of graphite, boron, alumina, and silicon carbide fibers, perhaps forged in the zero-gravity of space, would be a suitable material. But uncertainties exist regarding effects the space environment would have on such a cable, and other problems exist as well. Concern has been raised that an Earth-based tower would present a hazard to aircraft, or might collide with spacecraft and orbiting debris.

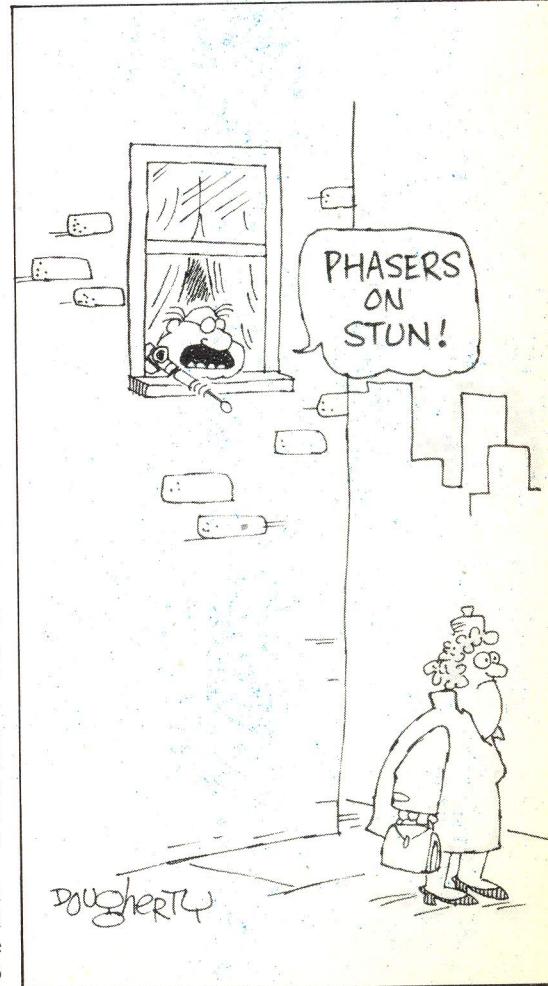
As to the future of this technological "Jack-in-the-beanstalk" project, Pearson emphasizes that space elevators should be studied further. Most certainly, towers into

space represent a first-line of newly emerging proposals which will promote initial gasps of disbelief—but so did a human walking across the Moon, little more than 10 years ago.

Going up? Next floor... space!

Once the single strand is in place, first dropped to Earth from a geostationary space-craft, automated crawlers would travel up the thread with additional wire. With each filament placed in orbit, the total amount of weight the collective lines could hold would be dramatic. With time, sections of tube could be stacked all the way into space. Pearson estimates the project could span a mere 10 years. Although cost estimates are a little premature, the Air Force engineer feels the entire elevator program might ring in at the price tag of an Apollo program, \$25 billion, perhaps less.

But the savings would be astonishing. An operational space tower could effortlessly lift millions of pounds per day into orbit. Using the tower, an interspace delivery system might be developed, shipping space-scarce quantities of Earth's carbon and water to space colony locations. In addition, by using the extra energy provided by Earth's rotation, an elevator-launched payload could be catapulted to the Moon or beyond, right out of the solar system!



Starlog Goes Japanese

STARLOG now has a very special Japanese language edition, chock-full of rare color stills and Japanese SF news. STARLOG, published in a format you've never seen before, features bold Japanese graphics, with fantastic full-color, pull-out posters in every issue. Packaged in a plastic, laminated cover, the Japanese STARLOG is a visual treat for all SF collectors and enthusiasts.



A limited quantity of the Japanese STARLOG, issues No. 1-7, has been imported for U.S. fans. The premiere issue features STAR WARS and includes a double poster featuring Wonder Woman and a full-color spread of 62 SF film posters from the collection of Forrest Ackerman. Issue No. 2 highlights science-fiction television and focuses on STAR TREK, with a starship Enterprise poster and blueprint details. Issue No. 3, the special-effects issue, contains a combination color poster of a planetary landscape SPACE: 1999 Eagle 1 blueprint and SF graphic catalogue spread. No. 4, the Gerry Anderson Supermarionation issue, contains (2) triple pull-out posters filled with Shusei Nagaoka artwork, X-wing Fighter blueprints, Godzilla animations and Thunderbirds Are Go! model poster. No. 5, the Superman cover issue contains a triple, fold-out poster of Superman in flight. The issue features original science-fiction and comic artwork from Japan and other parts of the world. Also included is a preview section on the Japanese version of the Starlog Photoguidebook to SPACE-SHIPS. No. 6, the cover and triple, fold-out poster inside features Wonder Woman in dazzling full-color, but there's much more: 18 page 'Horoscope' section—a Japanese guide to well-known creatures; fantastic SF artwork of Godzilla and space travel; the Japanese history of robots. No. 7, the Star Hawks cover is the introduction to the most Japanese influenced issue, yet. Much of the contents has never before appeared in the U.S. Also included is Forry Ackerman's SF souvenirs double Frank Frazetta fold-out, full-color photo collages and other visual treats.

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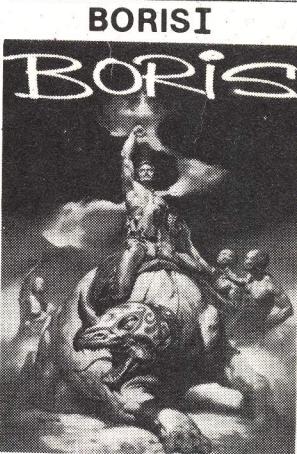
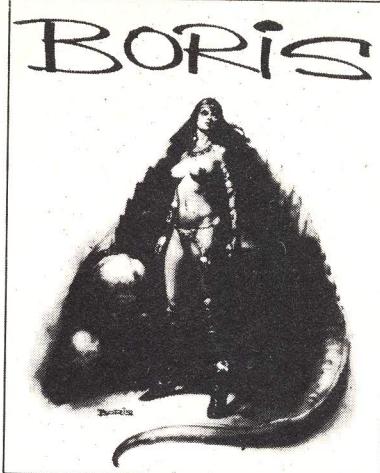


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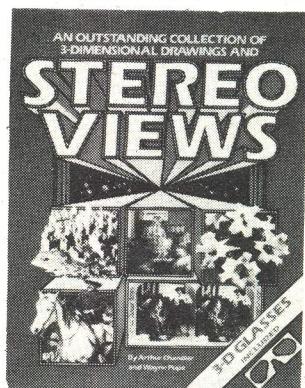
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(continued from page 57)

being punished for it. And then there's the question, what do you do about crimes against property? Leary and other libertarians say that a criminal should have to repay. Now, if we're talking about a society in which there's still poverty and the criminal can't repay, then the state should pay the victim. And then the criminal literally has a debt to society. He would have to work off his debt to the state; so the person who was ripped off would get back the money to buy whatever was ripped off. And the criminal would have to pay that off to the state by doing socially useful work. We would have a tremendous amount of forest rangers, hospital orderlies, and so on, who would not add to the tax rolls as convicts do. And then comes the question: What about crimes against people? The obvious answer, until we have a cure, is that those people have to be segregated from the rest of society, but they don't have to be put in cages, which only makes them worse.

The cage experience is neurologically punishing and disorienting. Somebody has to be a neurological adept to get something profitable out of the present prison experience. Most people are pretty racked up by it, and come up more crazy-mean than when they went in. Tim Leary says to put them in col-

onies without cages. Take a whole state that's practically uninhabited and make it a gigantic colony where these people can go, with their girl friends, their wives, their families, or whoever will go with them, and have whatever kind of lives they can make there, like the first pioneers in Australia, who were composed of the criminal classes. Just get them the hell away from the rest of us so we don't have to be victims of their violence any more. This makes a lot more sense than the current penological system, in which if somebody rips you off or kills someone you love, you, along with all the other taxpayers, have to support the institutions which will maintain them for five to 20 years—or whatever—and where we murder the murderer on the idiot logic that one plus one equals zero. Capital punishment is no deterrent, it accomplishes nothing, and it just shoves the problem under the rug.

We're on a leaky lifeboat, you might say; every time we shed blood, we attract more sharks. As the Buddha said, "Hatred does not stop by hatred at any time. Hatred stops by love." The amount of violence in our society is directly proportional to the amount of glorification of violence in the media. There's this general idea that the only solution to any problem is to shoot the bad guys. We've got to come to a basic change in philosophy where we recognize that every human life is important. And so, an adherence to life extension, cryonics, and so on, is just an extension of an involvement with pacifism. It's an expression of the same thing. This is a terribly violent society if you compare it with, say, Sweden, for instance. There's nothing innate in human nature that says people have to be violent as Americans are today.

Apollo 11

(continued from page 31)

slowly, we came down from our "high," waking up to reality. After all, Apollo had been initiated as a kind of psychotherapy for the nation. As such, it had been hugely successful. Now, having done the job, it was time for us to ensure a more solid future for manned space flight by bringing it into the realm of social relevance, people needs and economic realism. Above all, we realized clearly and sharply that the future of the space program depends on the quality of the program NASA can provide the public and the Congress.

Today, that's what it's all about. The promise of Apollo is still with us: New dimensions for our material and spiritual well-being. For, as the great astronomer George Ellery Hale said,

"Let those who complain that too much money is being spent on abstract knowledge while people are starving remember this: The alternative to knowledge is savagery. Their very existence as stowaways on this voyage of civilization is owing to advances in science which permit some to live without doing their share of the work. Let them be tolerant, then, lest by encumbering the useful ones they destroy the thing which keeps them alive."

And when civil rights leaders Rev. Ralph Abernathy and Hosea Williams led an old mule-drawn wagon and 150 poor blacks to the launch of Apollo 11, NASA's Tom Paine told them,

"I want you to hitch your wagon to our rocket and tell the people the NASA program is an example of what this country can do. I personally, and the members of the space program, feel that the space program is a program for all America, and we hope it will make a resolution for Americans to band together to fight the problems you are talking about."

Today, that rocket is the space shuttle. It alone is the key to fulfill what Apollo has promised. The new program of its economic use, and of industrializing space that is being designed around it, is in direct response to the down-to-Earth needs and demands of people everywhere.

Ten years after Apollo 11, the Apollo expeditions are only shining memories, but their legacy is all around us. Because of them, we know that the space program is inevitable and that it will exist as long as humanity exists. Because of them, we know how to design and launch the new transportation system, the shuttle, which will allow us to take the first step into a future alive with new frontiers and unlimited growth. And because of them, the shuttle's first flight into space will herald the First Day of the New World.

Our plans may have entered limbo. But the vision is still there.

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By ALVIN TOFFLER

Alvin Toffler coined both a catch phrase and a state of mind in 1970 with the publication of his book *Future Shock*. The work accurately portrayed the reactions of a slow-moving society caught in a fast-moving world. Toffler, a former editor of *Fortune* and a Washington correspondent, got interested in futurism in the 1960s, teaching one of the first courses in the "sociology of the future" at the New School for Social Research in 1966. He is the author of *The Culture Consumers* and the editor of such books as *The Futurists* and *The Schoolhouse In The City*. His newest book, *The Third Wave*, will be published this fall by William Morrow and Company.

Learning for the Future

Today's educational system just doesn't work. Schools are plagued by so many problems that it's hard to focus in on just one. However, curriculum seems to be a major one. Present-day curriculum is based on a certain number of assumptions made by educators. One of their key assumptions is that the way of life we have today is going to continue indefinitely. That in itself is false. The way of life we have today is changing rapidly. Life will be radically different 10 to 20 years down the line. In present-day schools, the better students are educated for *today*, the worse they will function *tomorrow*.

For the schools to survive, teachers and students have to spend a lot more time thinking of the future. The future of the family. The future of society. The future of the student. The future of love. The future of war. The future of work. The future of play. The future of communications. All of these are going to be different. Powerful forces are changing them all and unless we begin taking these forces into account, we are going to educate people for a world that no longer exists.

At present, there is little connection between education and day-to-day life or work. This is going to have to change in the not-too-distant future. Many young people are discovering today that the degree—that piece of paper that once was very important in securing a good job—is losing its impact. It's safe to say that the educational system will have to cater to a more work-oriented mode of schooling in years to come. For instance, there are millions of young people today who do very poorly in our factory-like school system and who would do much better in apprenticeship programs. I think we are going to see a shift out of the classroom nationally, with more and more education taking place in the streets, in the office, in the factories, and most importantly, in the home.

Of course, by that time, the home will be much different than the "home" as we know it today. Using television and telecommunications, students will be able to communicate with other students, hold conferences with

their teachers, and play games related to their education without leaving their home. The physical structures called "schools" will serve more of a social function than a teaching one. Many students will be able to reach individual fulfillment by using the particular methods best suited to them.

The changes needed to bring about this new system, however, have to be instigated now. At present, there's a big movement in this country preaching "back to basics." Lots of parents are honestly worried that schools are producing graduates who cannot even read or write.

Parents feel that this weakens the chances of a student having a decent life in the future. Well, fine. That's an honest concern. However, their assumptions about what is "basic" may very well be obsolete. In math, are yesterday's "basics" valid when kids come into class with hand-held calculators? Soon, computers will be as common as transistor radios. In an era of change, do the "basics" stay the same?

Even the issue of literacy needs to be re-examined. People today "read" television. That in itself requires an education. In Canada, for instance, an updated literacy test was given recently that never used a single printed word.

One school gave children, six and seven years of age, small TV cameras. The children were taught how to use the cameras and then told to go out in the streets surrounding the school and make a three-minute film showing how beautiful the area was. The kids went out and found "beautiful" plants and buildings, filmed them and brought back a completed "movie."

At that point, the teachers sent the kids out again and told them to film what was *ugly* about those same streets. The kids went out again and found things they didn't like about the block. They shot a second film that was the antithesis of the first.

Now, these children were really being taught a kind of literacy. These children, all children, spend a lot of time watching television. These students now know, through per-

sonal experience, that everything they see on a TV screen has been pre-selected, pre-edited and is slanted or biased to some degree. They now know, even as many adults don't, that television presents select aspects of reality. These children have become, therefore, much more sophisticated television readers.

In my view, that skill is basic in today's society. And that may be as "basic" as some of the skills that were once considered part of the "three R's." I would respond to the slogan "back to basics" by saying that we may need basics but our purpose should not be to go back to basics, but rather, to go forward to basics.

I think that, by "learning for tomorrow," we will also bring about "action learning." In the past, schools were built on the assumption that students were passive and that teachers needed to pump their heads full of learning. That's an obsolete concept of education. When you live in a slowly changing society and teachers tell you something about the outside world, it may be safe to believe them. In a rapidly changing world, however, when a teacher says "This is the way it is," the information may be obsolete even before the class is over. To circumvent this, students should have a chance to test the abstractions taught in the classroom with real life. That means more "action learning." More community service. More political participation. More—not less—school credits for work done outside the classroom. This would lead to a far more interesting and useful education.

Many students unconsciously want this active stance. Even though millions of students today go into a traditional classroom situation and are, in effect, a captive audience, education is at an all-time low. You can put people in a classroom, but you can't make them learn. And I think what we're seeing today, in terms of school violence, vandalism, truancy and drug use, is a rebellion against the worst features of traditional education. These widespread problems do not reflect the decisions of a few "bad kids." They reflect something about the relationship between the school and society as a whole. In fact, they reflect the disintegration of traditional society as we move forward to a new kind of life.

The so-called "lull" we're seeing on college campuses is a symptom of this as well. *Time* magazine and the "establishment" media say that the students of today are like the "silent generation" of the 1950s. I think they've got it all wrong. The students of the 50s believed that they and their society were both on an upward path. If they just got their grades, they had it made. They didn't worry about the future because the future looked beautiful. If the college students of today are silent, it's not because they're content. The exact opposite is true. They're distressed, worried and unhappy, but don't know what to do about it. There's a big difference between the two situations. To call them

"50s-like" is wishful thinking.

If society goes into crisis in the next few years, which I think is likely (economically, politically and ecologically), the schools aren't going to stay quiet for long. Already there are stirrings within the system. There may be random violence or organized terrorism occurring regularly unless we straighten things out, unless we make changes within the educational system to make it relate to the life of tomorrow as opposed to yesterday.

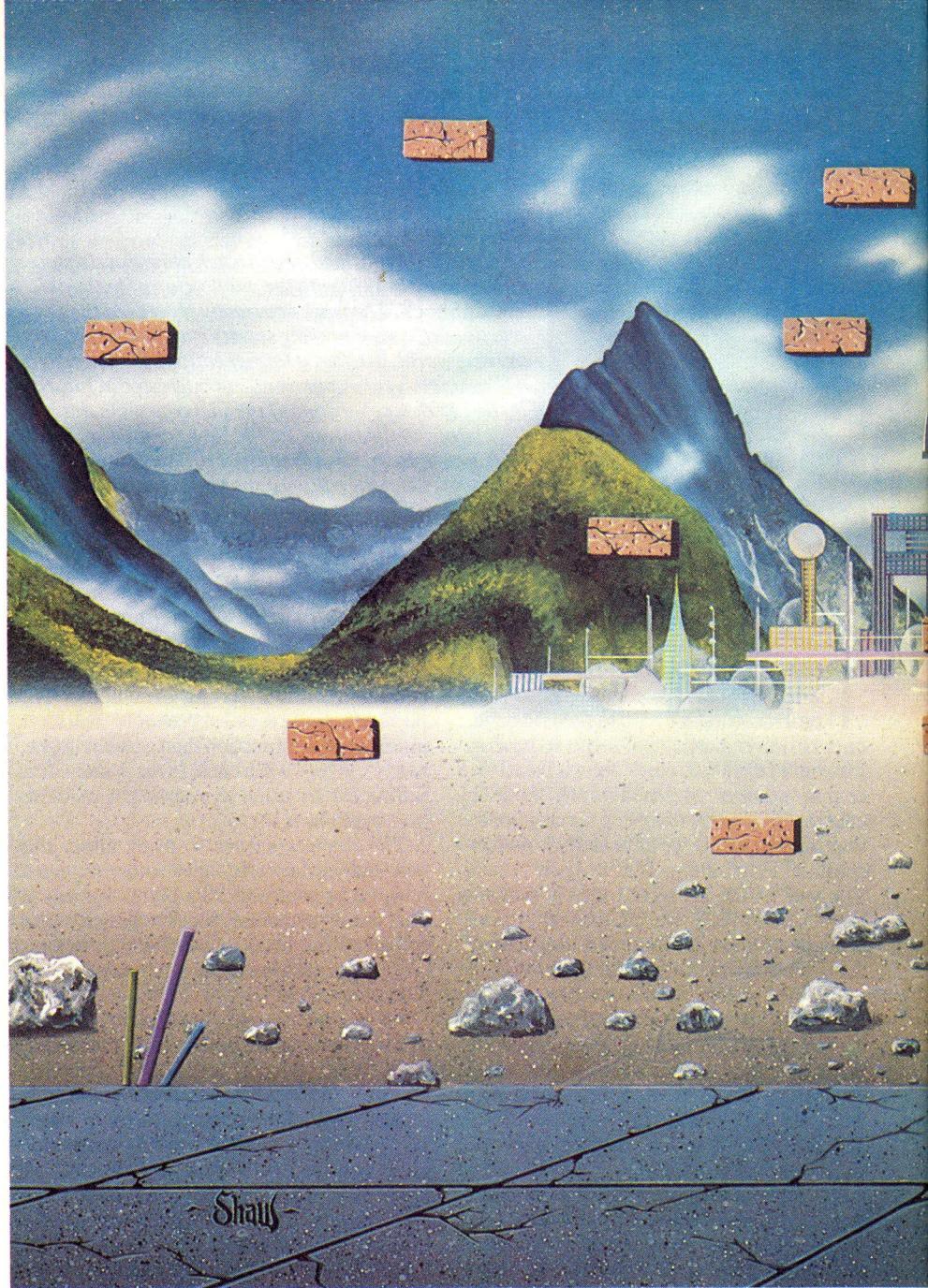
Courses on the future—the future of work, the future of the family, the future of the planet—are necessary. But I don't think that futures courses will do the trick entirely, either. It seems to me that there are some things that everyone should learn and some things that only certain people should have to know. The things that everyone needs to learn usually don't come packaged as courses in school. They have to do with relationships between people. They have to do with values. They have to do with learning to "learn" and "unlearn."

Today's society is experiencing a plague of loneliness as the sense of "community" breaks down. We have millions of unhappy people in our society who cannot make contact with appropriate partners, who are searching desperately for companionship. Schools have done nothing to address this problem. The question of *relating*, the question of forming friendships, ought to be high on the agenda of every school today as we move through a period of great social change.

If we're indeed moving towards a more complicated society, then people really need more skill in learning how to choose, how to make decisions. And this means a study of their own *values*. People today who don't really understand their own values tend to cancel out their own decisions. Usually, they wind up a mess.

One last emphasis for future schooling: Because change is so rapid, what we learn today may be totally passé tomorrow. Therefore, we also have to learn the skill of being tentative about what we know. We have to learn how to be uncertain rather than certain. We have to learn to be flexible, how to erase yesterday's tape and prepare a new one.

These are the processes that all schools should concentrate on now. Simultaneously, I believe that schools should offer a wider range of subject matter than most now do. Students should be given the most diverse choice of subject matter possible. They should be learning everything from how to organize an undersea colony to how to solve a traffic problem downtown, from how to take an automobile apart and put it back together to what the relationship is between energy and society. Students need to learn a variety of communications skills. They need to know how to read and use the media, how to talk, how to understand film, how to work with computers and data banks. But not all students can—or need to—know everything.



ART: ©1979 BARCLAY SHAW

This introduction of action and variety really means a total revolution in education, in that the role of the teacher will change dramatically. The teacher will become a learner, not just an instructor. The "teaching team" should include thousands upon thousands of ordinary people from outside the schools who have skills in marine biology or carpentry or engineering or advertising, retired people or working people who could become part-time teachers, and who would take individual students under their wings as apprentices.

All this opens up an opportunity for teachers, many of whom are more bored than their students today, to get out of the classrooms and join their students in participating in community services. They'd wind up benefiting from the experience in a number of ways. Action learning, with teams of students, teachers and community people working together to solve community problems could help break down age segregation

in the school system. Student groups will then reflect society. When you take a bus, you don't sit in a certain section because of your age. Different age groups have things that they can teach each other. School seems a natural place for it to start.

As you can see, such changes are enormous. They will be difficult to accomplish, but they are absolutely necessary if we are going to prepare ourselves, as a society, to live in an emerging future. The present-day system won't be replaced instantly. I think we're going to see a number of battles which are political, ideological and perhaps even physical over control of the changing school system. Eventually, out of that conflict will arise new models of learning and new ways of linking school and society.

Alternatively, the main system could continue to grind along on its merry way and grind up the students in it, while all sorts of alternative educational systems spring up to take care of the increasingly large number of



young people who just don't, or won't, fit into the system. We'll see more alternative high schools like the one present today in Brentwood, Long Island's school system. We're beginning to see a little of this evolution happen today with a shift toward more work-relevant educations, with the government and large corporations funding work/study programs.

But it's important to remember that we need not one, but many kinds of alternative systems. You just can't have one, unified design. We have to create different types of school systems for different types of students. Some students need a highly structured classroom situation, while others need an open classroom. We can never assume that everyone needs the same sort of educational structure.

Until these changes come, however, students will have to learn to cope with the existing system. There are several ways to attempt this. You can simply accept the values

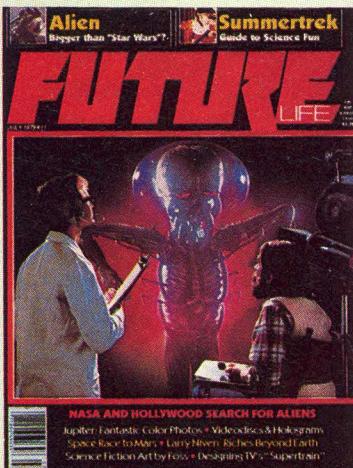
of the system, get your grades, graduate, go for a job, stop thinking, give up and play the game. Or, you can play the game, conscious that it is only a game. Since you are, in effect, a captive of the system, you might as well use it, exploit it... but realize that it's not the only learning game in town. Use its resources but, if you're really interested in developing yourself for the future, try to find additional work or activities and then tie them in with your education. Try to find ways of involving yourself in artistic, community or political activities that will give some meaning to your studies.

After you get out of school, if you go to work in a school or in a hospital or in a company, bear in mind that you have it within your power to play the role of what I call a "Third Wave" rebel in shaping the future. I call the society we're moving towards a Third Wave society. The first major wave of change in history was caused by the agricultural revolution, the second by the industrial

revolution. The Third Wave is what's happening now. Third Wave rebels have a responsibility for the future, whether they're working in the stock room or the stock market.

Important changes don't have too much to do with who is sitting in the White House anymore. What's more important is what one million people are doing simultaneously in a million different places at a million different levels of our society. All of us have the opportunity to influence our own micro-environment. When enough of us do that, there is nothing much that the people on top can do to maintain the old systems. They are compelled to make changes. Many of the people on top are hungry for new ideas, but are afraid to try them. Only when millions of young people who are now in the system act, will those changes begin. We all have to make small changes in our own lives in order to bring about large change. That, in effect, is what education will one day be about.

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DISNEY IN SPACE

This Christmas, Walt Disney Studios will unveil the most expensive film in their history: the \$17 million space epic, *The Black Hole*. Aimed at an adult audience, *The Black Hole* will be very un-Disneyesque, offering nail-biting suspense and mind-boggling special effects. Next issue, FUTURE LIFE takes an advance look at this science fiction spectacle as well as a peek at Disney's upcoming time travel farce... *Unidentified Flying Oddball*.

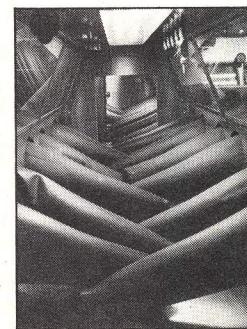


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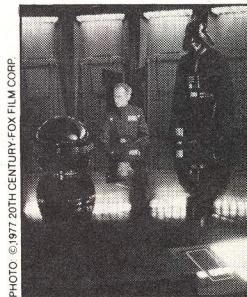


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GENETIC ENGINEERING

We are now living through a "bio-revolution." Scientists in the laboratory have it within their capability to create new and alien lifeforms by recombining DNA. Only a couple of decades ago, such notions were the stuff of science fiction imaginings, but living organisms are now being designed—and even patented! What are the potential benefits—and hazards—of this space-age biology? What steps are now being taken toward the ultimate potential of genetic engineering—redesigning the human species?

FUTURE ROCK

Rock and roll heroes first turned their tunes towards science speculation in the 1950s, with songs of alien invasions and saucers from space. These days, however, the pop culture is taking its futurism seriously; constructing sonic experiments that are as ambitious as they are mesmerizing. In "Sound Ideas," rock critic Jon Pareles examines the world of Pink Floyd, Brian Eno, Kraftwerk, Tangerine Dream, Terry Riley and other spacey musicians.

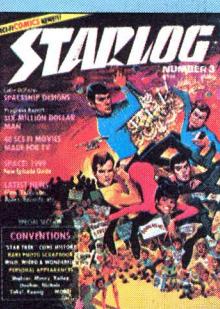
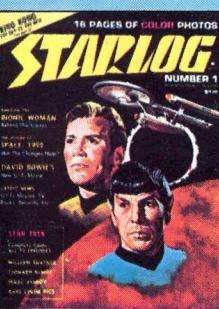
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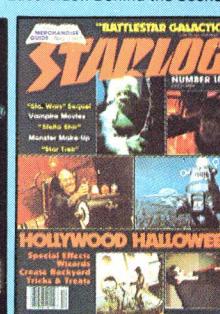
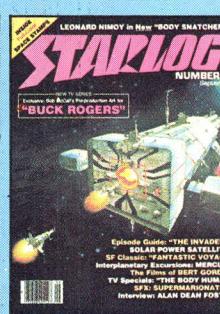
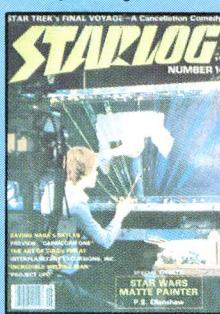
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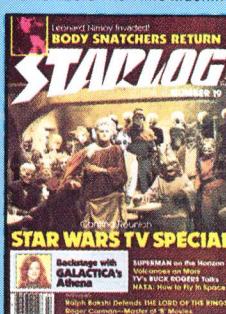
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